GRASS VALLEY GROUP
TELEVISION EQUIPMENT CATALOG
NO. 16

This 'Short Form' catalog

offers only the briefest possible technical description of typical models in the Grass Valley Group product line. More details are available in full data sheets, reprints of technical papers, engineering drawings, separate photos, and video tapes. To obtain such information, call or visit your nearest GVG field sales office (listed on the last page) or use the postpaid reply card attached to this catalog.

Since prices and specifications may change at any time, as noted elsewhere on this page, it is most often convenient to check with GVG marketing for latest information before ordering.

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1600 SERIES SWITCHING SYSTEMS

Grass Valley Group created the 1600 Series in direct response to customer requests for improved production facilities. Acceptance of the 1600 philosophy is attested by the hundreds of systems in service throughout the world. The soundness of the basic design is also indicated by the number of similar offerings from other manufacturers. The 1600 concept has thus become the industry standard - - the standard by which all other systems are measured.

The heart of all 1600 Series

models is a unique, combined mixing and special effects system which provides mix and wipe transitions as well as transitions to a keyed insert or to a preset pattern. Each mix/effects system is complete with matte colorizer, pattern generator, and joystick positioner with modulation.

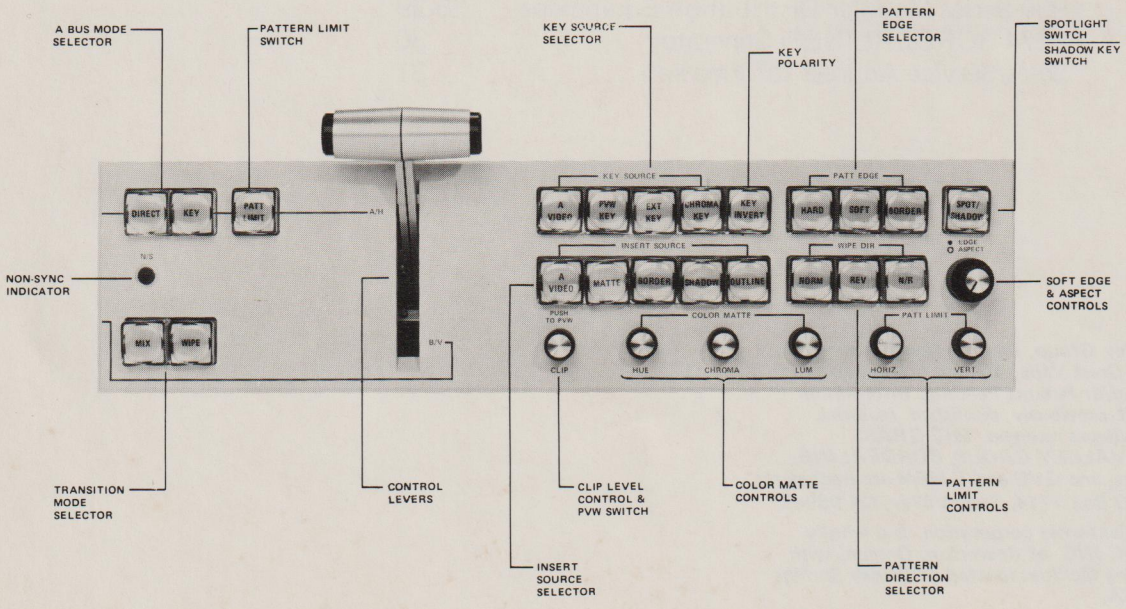
Mix/effects systems

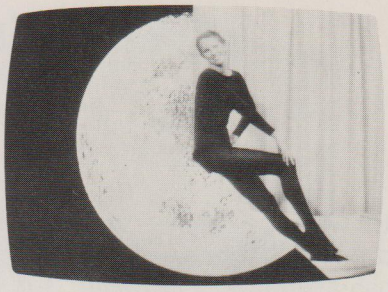
receive input signals from two switching buses. These signals are then applied to two pairs of proportional control devices (program channel and preview channel). The devices are variable-gain amplifiers which respond linearly to the control signals applied. The processed output of a mix/effects system is thus the product of the video inputs and the applied control signals. The same control elements are employed in all modes of operation - - mix, wipe, and key.

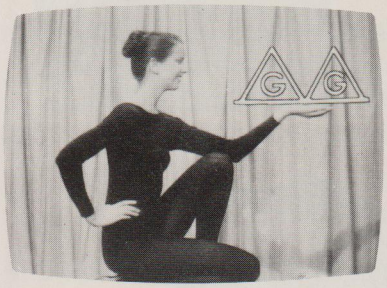
Proportional control

allows soft wipe, vignette, and other effects to be obtained by appropriate shaping and modulation of the control signals. A dramatic improvement is realized in the case of chroma key operation, since the performance is no longer dependent upon keying signals reaching a threshold level. Chroma keying through glass, smoke, and other translucent materials can now be accomplished without the usual breakup and tearing associated with conventional techniques. The exclusive 'shadow key' system provides a further basic improvement.

Above (from top): Soft wipe, pattern border, and Shadow Chroma Key. *Below:* Switcher mix/effects control section.







Top to bottom: photos illustrating rotary wipes, BORDERLINE, quad split, Digital Video Effects, and a 1600-2V production switcher with integral E-MEM control, at right.

A wide range of standard 1600 models

is offered to suit customer requirements. Most models include rotary wipes in addition to conventional wipe patterns. All models employ the same basic design concept. The differences among models are primarily the number of input sources and the number of mix/effects systems provided.

The capabilities of the various models can be expanded by a wide range of standard options. Although some options require factory installation, most can be added in the field - - frequently on a plug-in basis. The following paragraphs describe some of the more popular options.

BORDERLINE® generators

are used to enhance the visibility of captions. Three modes are provided - - border, shadow, and outline. All of the various BORDERLINE modes are illustrated on the inside back cover.

The quad split generator

allows four picture sources to be displayed simultaneously. The horizontal and vertical separation points can be moved as desired. In addition, the separations can be enhanced by a variable width border.

The Digital Video Effects system

provides a wide range of optical type effects for NTSC models. Typical examples include continuous picture compression, picture expansion (up to 2 x), push-on/push-off, and 'hall-of-mirrors' effects.
Examples of Digital Video Effects' possibilities are shown on page 17.

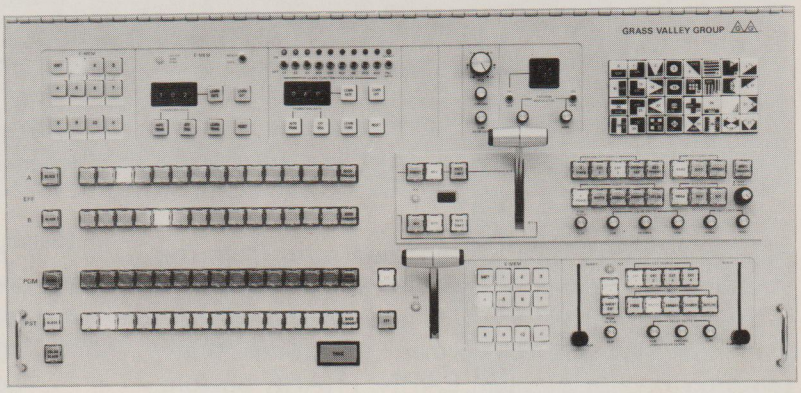
E-MEM

allows an operator to store both digital and analog control panel selections as well as auto transition rates in memory registers for later recall, thus facilitating switcher operation - - especially for complex or fast-moving situations. The system also contains computer interface ports to allow in-depth control of switching operations from external devices such as video tape editing systems.

Other options

for 1600 Series systems include auxiliary switching matrices, encoded chroma key systems, dual power supplies, audio-follow-video systems, and auto transition systems. The flexibility of the basic 1600 Series design allows systems to be tailored to specific customer requirements.

All standard 1600 Series models are available for operation on NTSC, PAL, and PAL-M television standards.



EFFECTS MEMORY SYSTEM

The studio switching system,

together with its many accessories, has evolved into a powerful production tool; however, in many situations the capability of today's switcher is not fully realized as a result of its complexity and size, even with a skilled operator. Thus from a practical standpoint, the teleproduction efficiency of the modern switching system is limited.

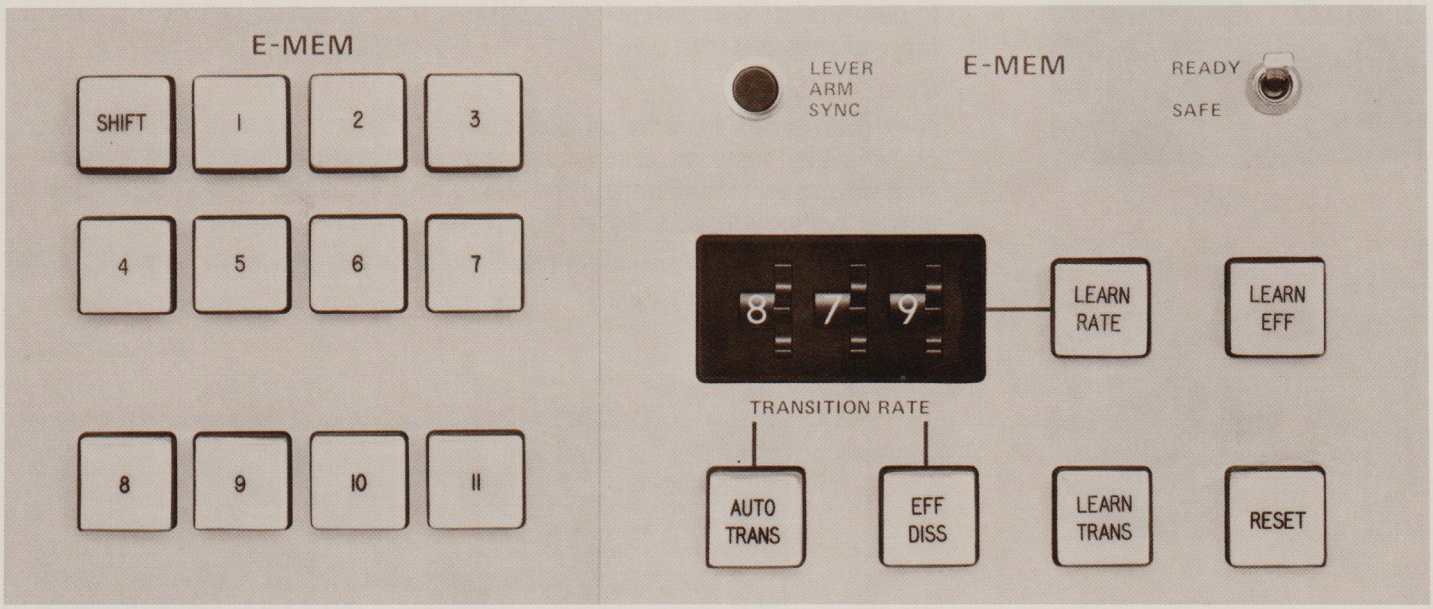
The E-MEM (Effects Memory) system

was specifically designed to make the operator's job easier and thus maximize his creativity. The system is a microcomputer based accessory for Grass Valley Group switchers which provides the following features:

- The ability to store complex effects setups for later recall, including the status of both analog and digital controls.
- Preselectable frame accurate transition rates, as well as the ability to remember the actual movements of the lever arms during a transition.
- Completely integrates with the switcher to allow either E-MEM aided or normal operation. Full manual override capability.
- Does not employ keyboards or CRT displays. The man/machine interface is the switcher control panel.
- A bi-directional interface for communication with video tape editing systems, character generators, and other peripherals.
- Retrofittable to existing Grass Valley Group 1600 Series switchers.

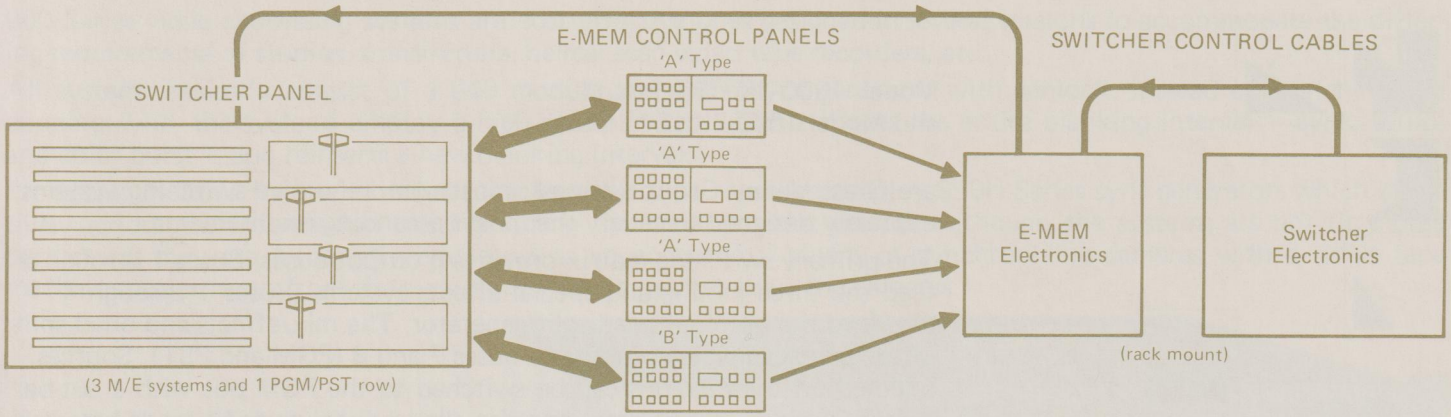
Operation is simple and straightforward

Once the operator has created the desired effect, he pushes the LEARN EFF button on the E-MEM learn mode panel. This operation effectively captures the M/E status. The operator then assigns the information to a storage register on the E-MEM register select panel. The stored data can be recalled at any time by pushing the register select button. Eleven registers can be selected directly; an additional 11 are available by use of the SHIFT button.



In a similar manner auto transition rates from the thumbwheel switches are selected and stored by operation of LEARN RATE and register select switches. Manually performed transitions are captured by use of the LEARN TRANS button. Stored transitions are initiated by operation of the register select switches. An auto transition (at existing thumbwheel rate) can be directly started by means of the AUTO TRANS button.

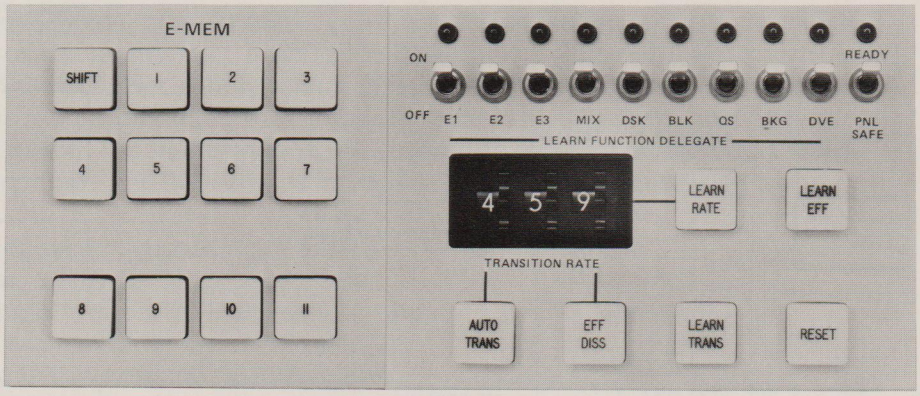
Use of the EFF DISS (Effects Dissolve) button provides an entirely new capability. For example, a wipe from a small rectangle in the corner of the screen to full frame. Such a transition is achieved by storing the end points (size and location) in separate registers, and pressing the EFF DISS button. The system can accomplish transitions between as many as 15 analog channels simultaneously. It is particularly useful in conjunction with the Digital Video Effects accessory.



Installation of an E-MEM system

is easily accomplished since it is merely connected in series with the switcher remote control panel cables. Normally, an 'A' type E-MEM unit is installed on each M/E system. A slightly different version of E-MEM ('B' type) is available for use with switcher PGM/PST buses, downstream keyers, Digital Video Effects systems, quad split generators, and other functions not specifically related to M/E systems. This latter version also provides overall control of the 'A' units.

Opposite: E-MEM 'A' (Mix/Effects) panel. *Right:* 'B' panel for overall system control, and functions not directly related to M/E systems.



The optional communications interface

allows E-MEM to 'talk' to peripheral devices. This feature is particularly significant in the case of video tape editing systems, since it provides the vehicle for in-depth control of the switcher. A standard interface protocol is now available.

The future of the E-MEM concept

is very promising, not only as a result of its ability to aid switcher operation, also by its ability to communicate intelligently with other devices. It is anticipated that the system will be 'married' to many systems used in television operations.

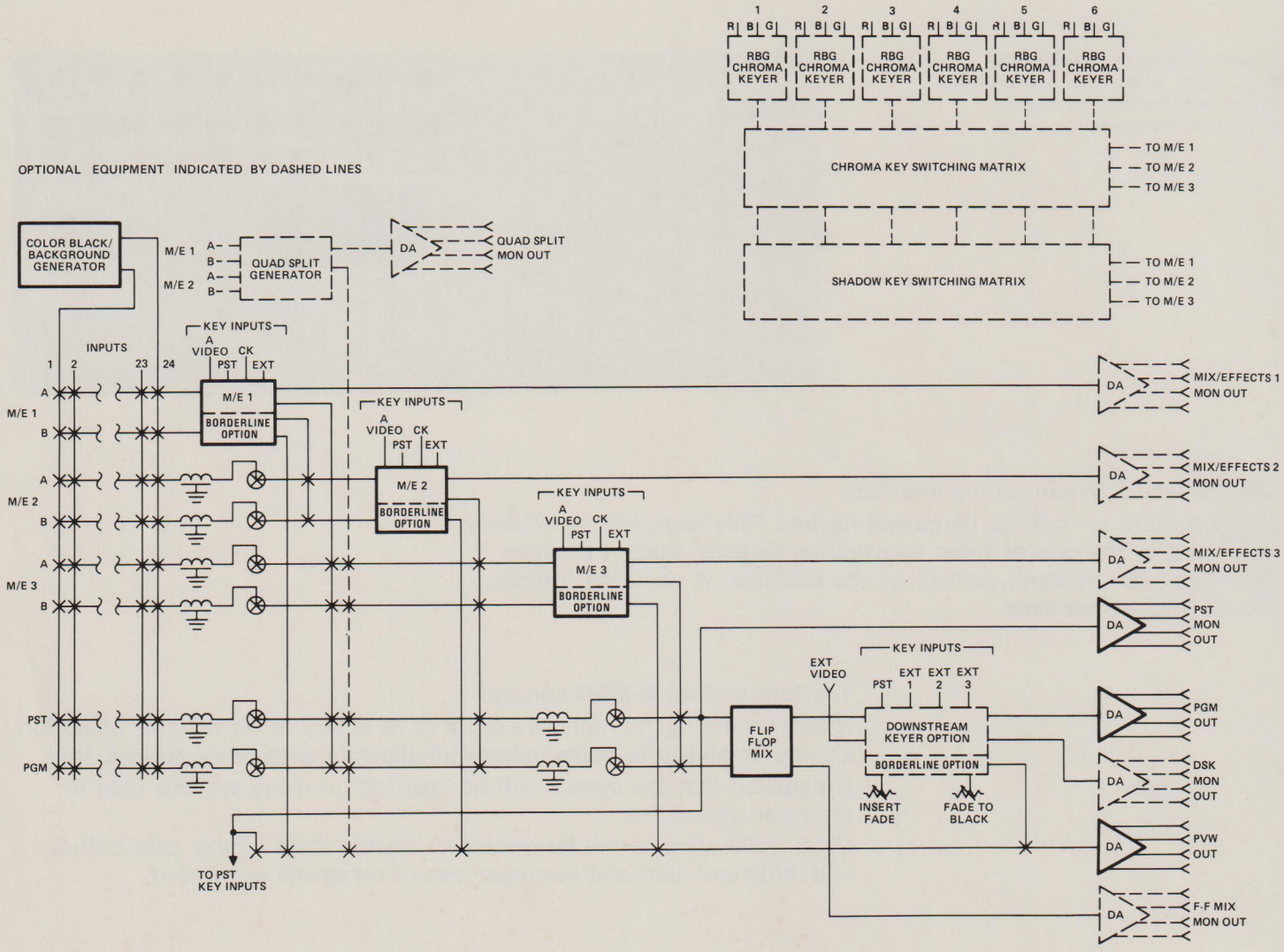
Grass Valley Group will be pleased to discuss these further possibilities with both end users and manufacturers of peripheral equipment.

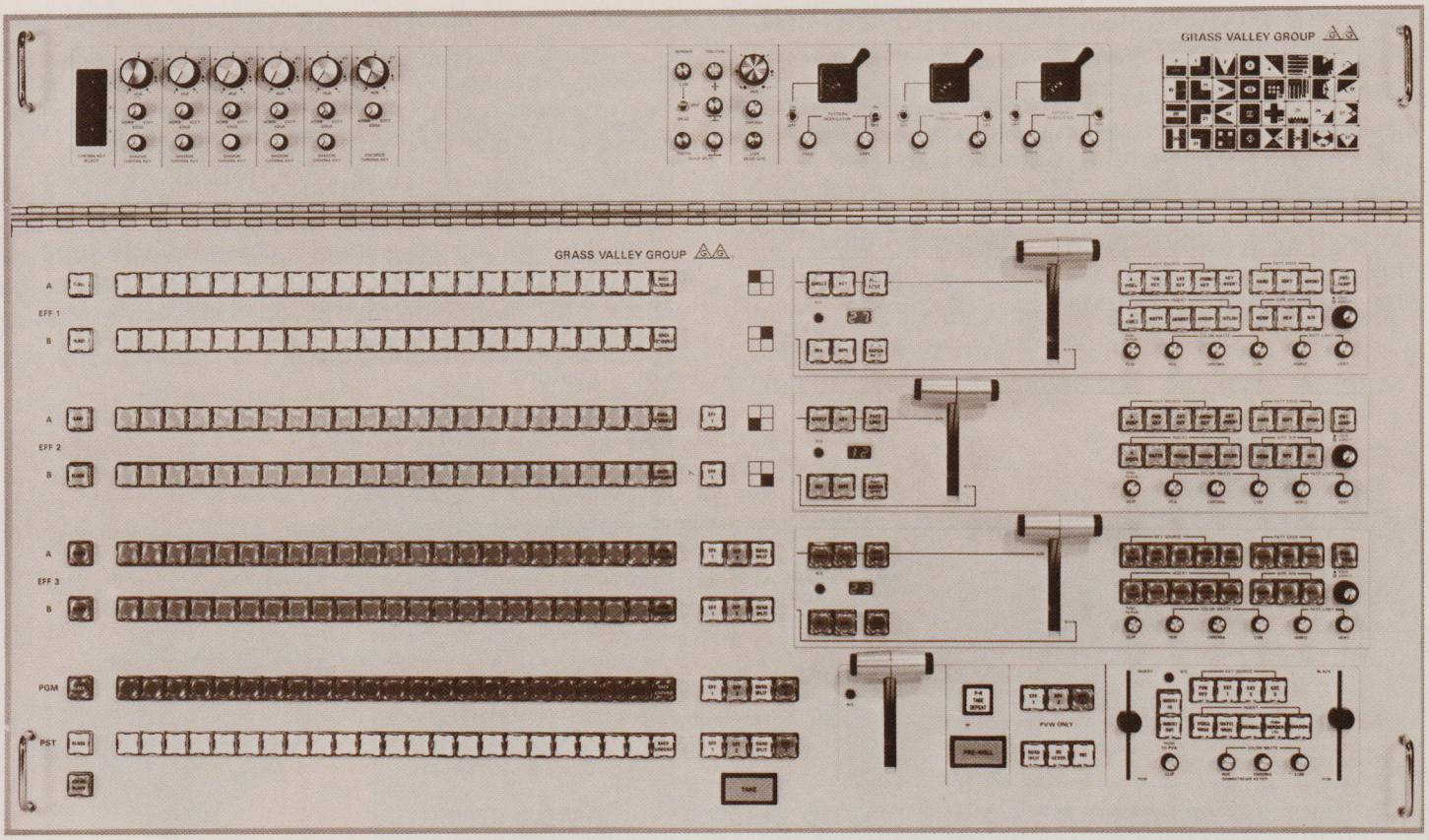
1600 SERIES SWITCHERS

Model 1600-3K (16 input)
and Model 1600-7K (24 input)

are Grass Valley Group's largest, most comprehensive switching systems, expressly designed to satisfy the most demanding requirements.

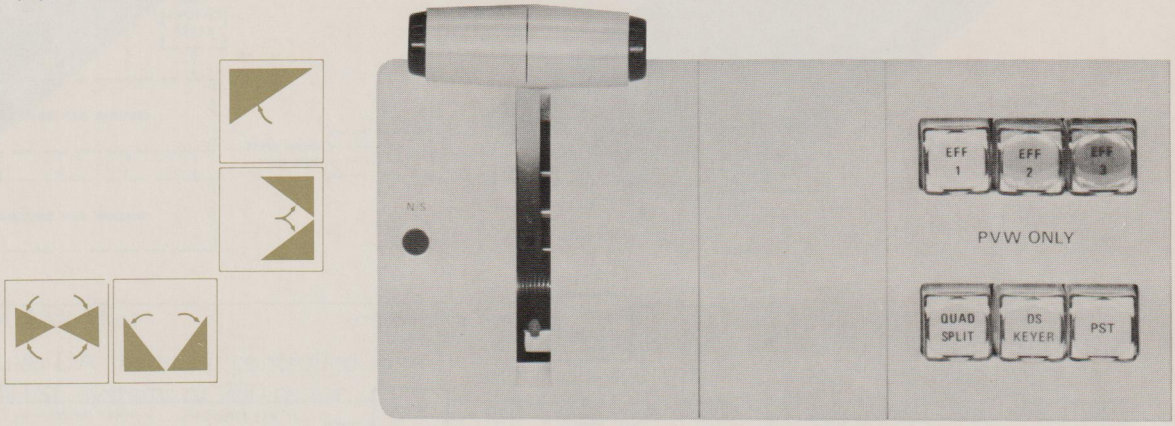
The primary switching matrix provides 8 output buses. Buses 1 through 6 feed the three mixing and special effects systems. Buses 1 through 4 also feed the optional quad split generator. The mix/effects and quad split outputs are available as inputs to buses 7 and 8 (PGM and PST). Sources selected on the PST bus can be switched to the PGM bus with a cut-bar switch. A video mixing amplifier also allows dissolves to be made between the PGM and PST buses. A separate facility is provided for previewing the mix/effects outputs as well as the optional quad split generator and downstream keyer systems.





Above: 1600-7K control panel.
Below: Detail, flip-flop mixer and preview section.

Each of the three pattern generators provide both rotary and conventional wipe transitions. Purely rotational effects include clock, windshield, and fan type wipes. The rotational generators can also be applied to many conventional patterns, e.g., a square can be made to rotate as it expands in size. Separation of the control levers allows independent control of size and rotation. The soft and border features operate with all conventional patterns and most rotary patterns.



Options available

for the system include RBG chroma keyers with shadow key, encoded chroma key systems, chroma key switching matrices, BORDERLINE generators for the mix/effects systems or downstream keyer system, analog BORDERLINE systems for NTSC, downstream keyer system, quad split generator, and the DVE and E-MEM systems described elsewhere in this catalog.

The switchers are supplied as completely tested, ready to operate systems. Available in NTSC, PAL, and PAL-M versions.

1600 SERIES SWITCHERS

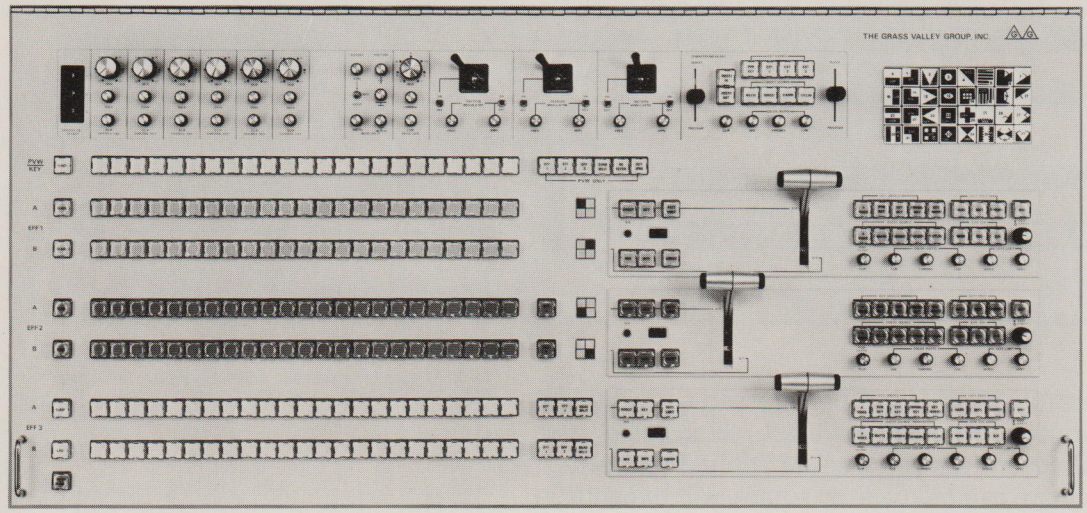
Model 1600-3H (16 input) and Model 1600-7H (24 input)

are NTSC switching systems intended for use in large television studios. Both provide rotary wipes. The systems are supplied complete with module extenders and two instruction manuals.

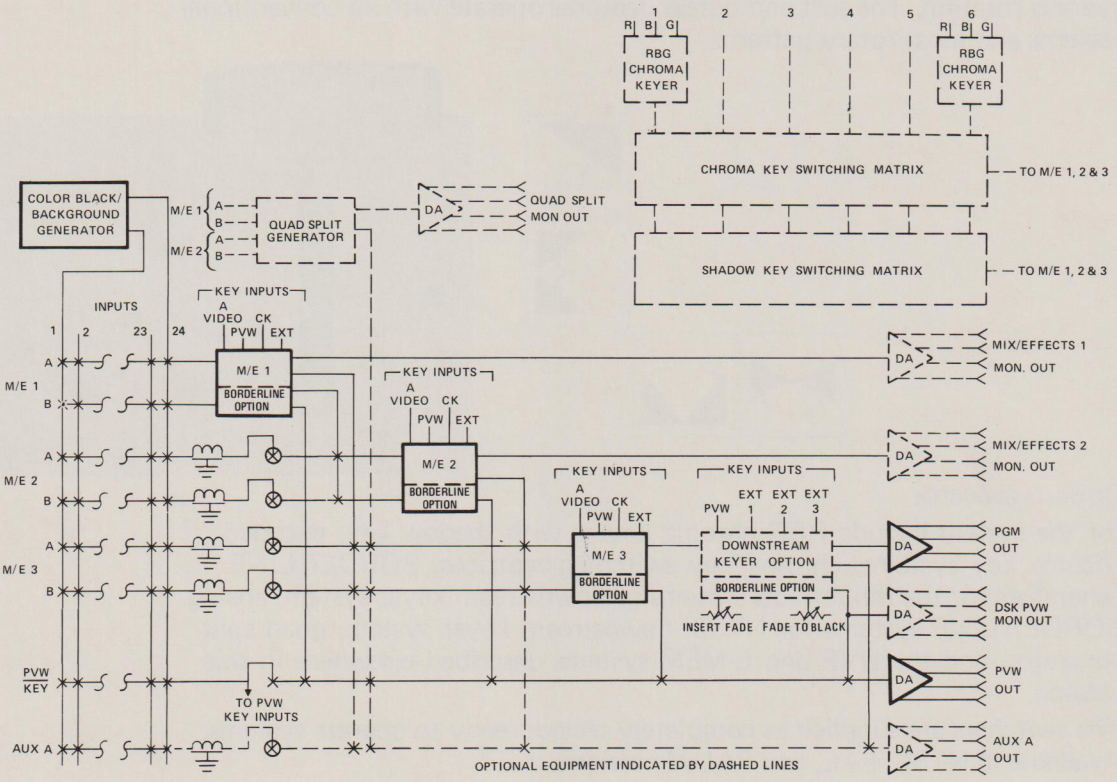
The primary switching matrix provides 8 output buses. Buses 1 through 6 are utilized to feed the three mixing and special effects systems. Buses 1 through 4 are also employed as input selectors for the optional quad split generator. Bus 7 is a combined preview/key bus. The eighth bus is an optional preview selector with a separate, remotely-located control panel.

Other options for the systems include RBG chroma keyers with shadow key, encoded chroma keyers, chroma key switching matrix, quad split generator, BORDERLINE® generators, and a downstream keyer system.

The systems are also available in PAL (625/50) and PAL-M (525/60) versions.



1600-7H



Models 1600-3F (16 input) and 1600-7F (24 input)

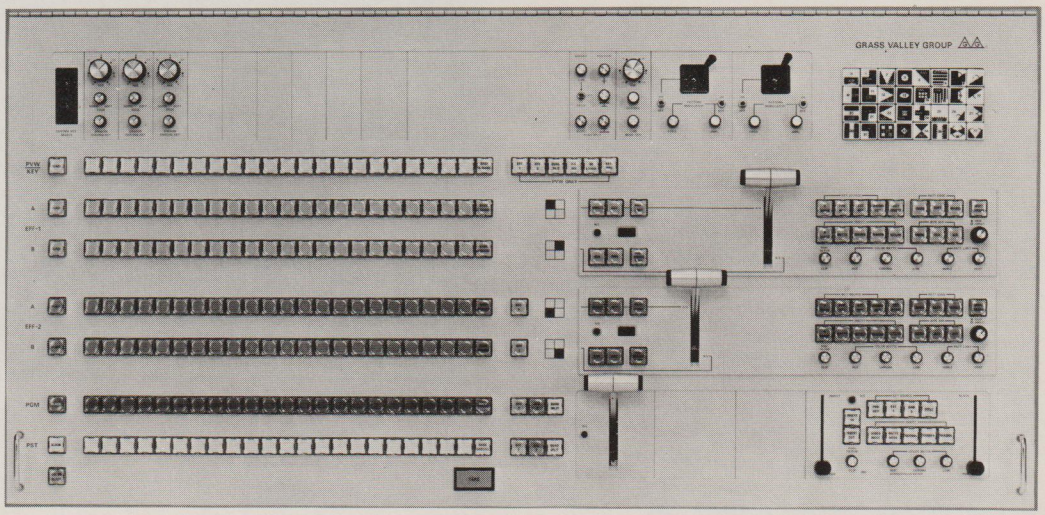
are flexible, general-purpose NTSC switching systems, with rotary wipes, intended for use in moderate to large-sized television studios. The systems are complete with module extenders and two instruction manuals.

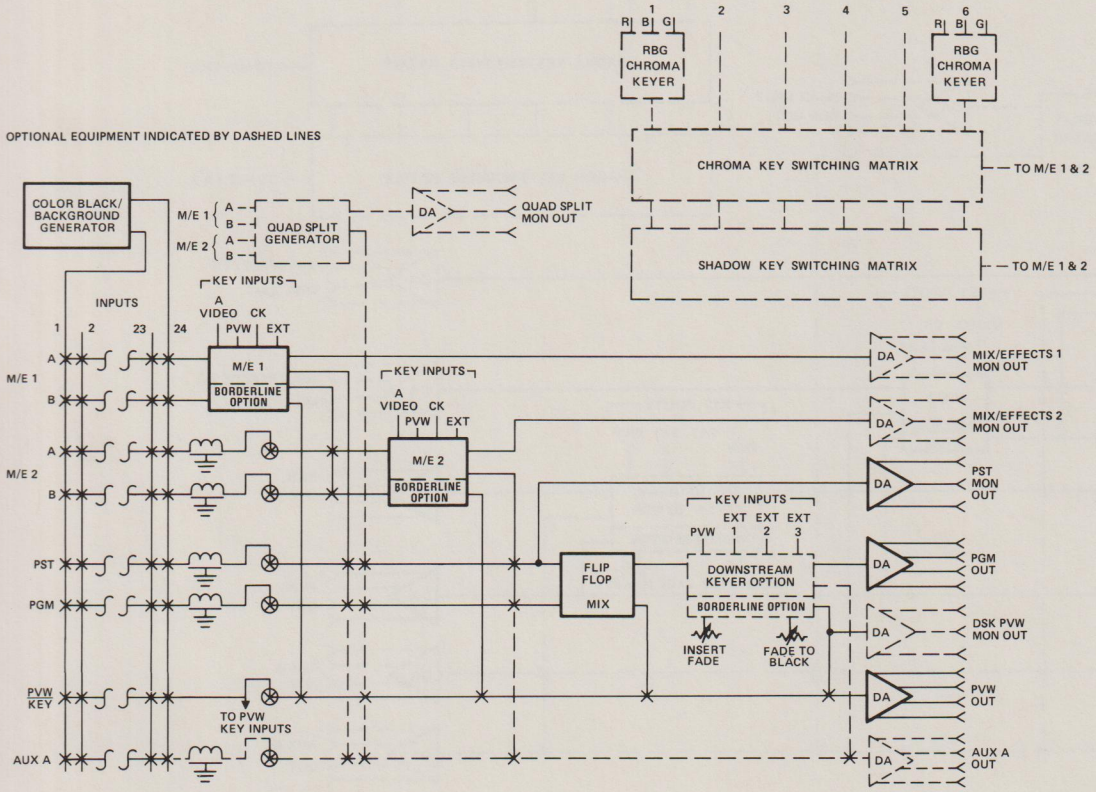
The primary switching matrix provides 8 output buses. Buses 1 through 4 feed two mixing and special effects systems as well as an optional quad split generator. The mix/effects and quad split outputs are available as inputs to buses 5 and 6 — PGM and PST. Sources selected on the PST bus can be switched to the PGM bus with a cut-bar switch. A video mixing amplifier also allows dissolves to be made between the PGM and PST buses. Bus 7 is a preview/key selector, and bus 8 is an optional preview selector.

Other optional equipment includes RBG chroma keyers with shadow key, encoded chroma keyers, chroma key switching matrix, BORDERLINE® generators, and a downstream keyer system.

The systems are also available in PAL (625/50) and PAL-M (525/60) versions.

1600-7F





1600 SERIES SWITCHERS

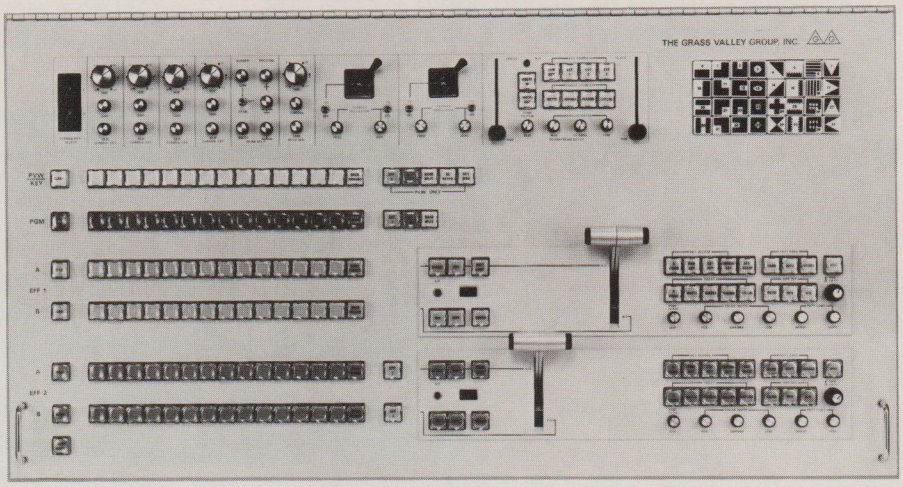
Model 1600-3D

is a general-purpose 16 input switching system intended for use in moderate to large-sized television studios. The system is supplied complete with module extenders, and two instruction manuals.

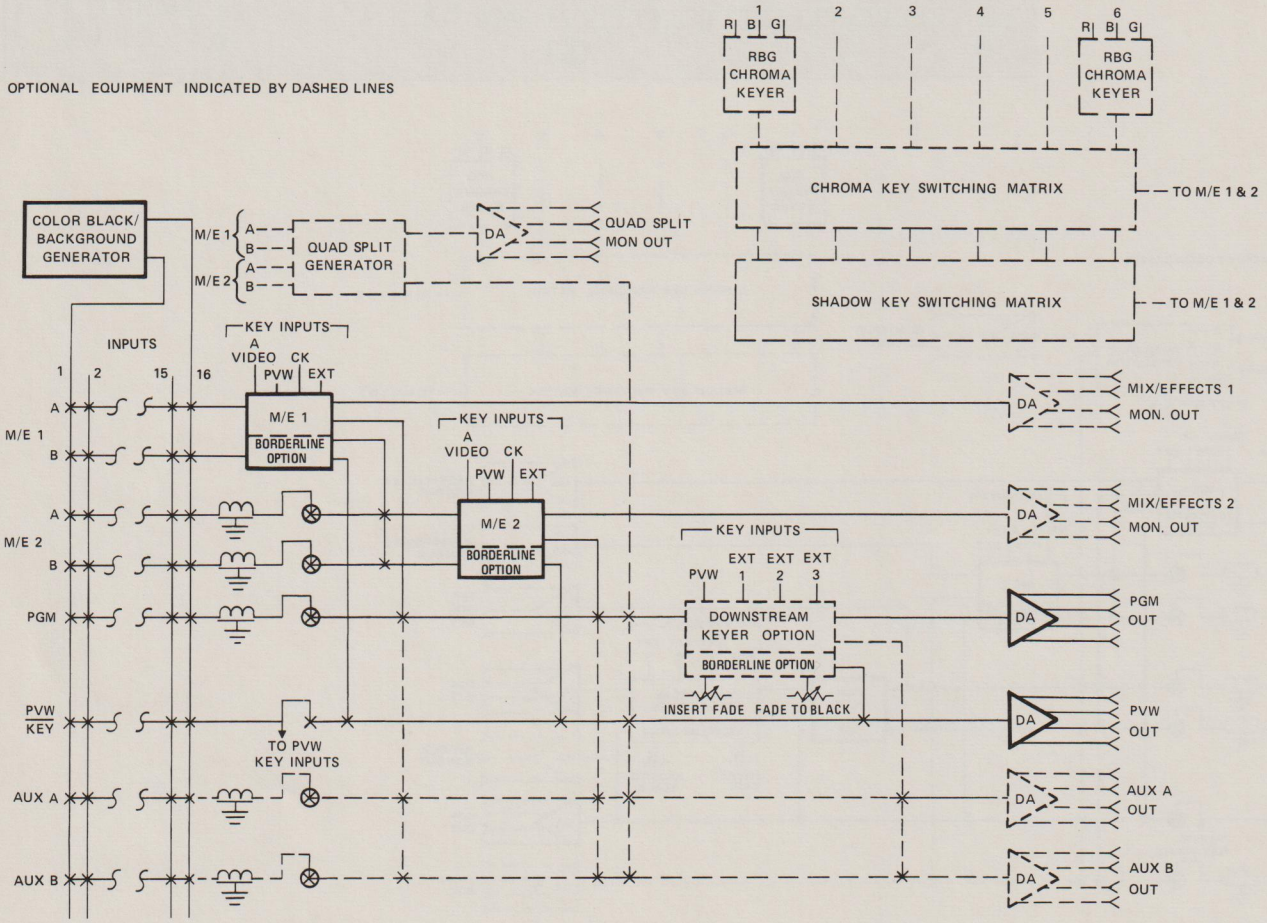
The primary switching matrix provides 8 output buses. Buses 1 through 4 feed two combined mixing and special effects systems, the outputs of which are available as inputs to bus 5 – a direct switching row. Buses 1 through 4 are also used to feed an optional quad split generator. Bus 6 is a preview/key selector, and buses 7 and 8 are optional additional preview selectors, with separate, remotely-located control panels.

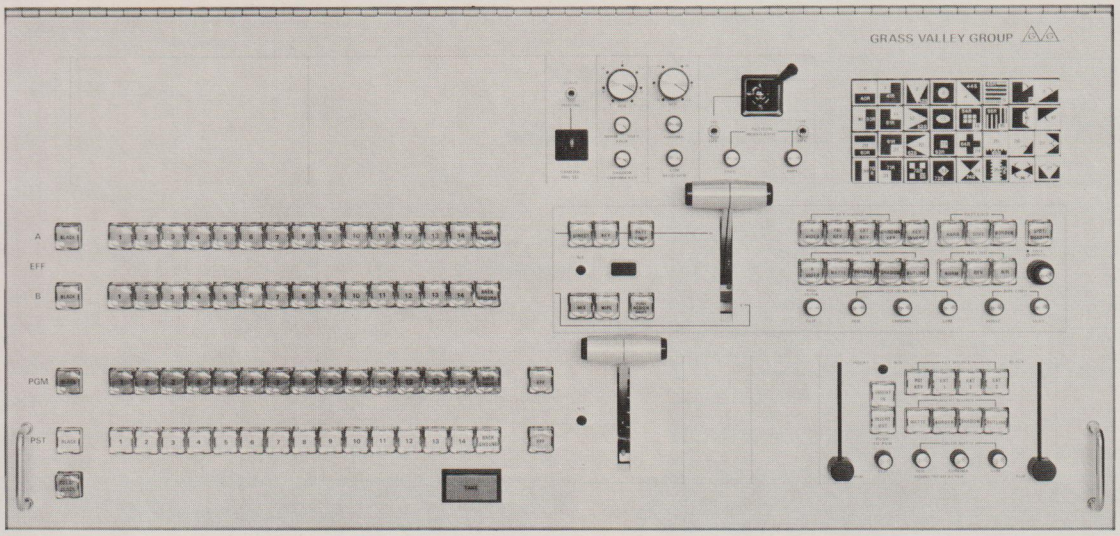
Other optional equipment includes RBG chroma keyers with shadow key, encoded chroma keyers, chroma key switching matrix, BORDERLINE® generators, and a downstream keyer system.

The system is also available in PAL (625/50) and PAL-M (525/60) versions.



OPTIONAL EQUIPMENT INDICATED BY DASHED LINES





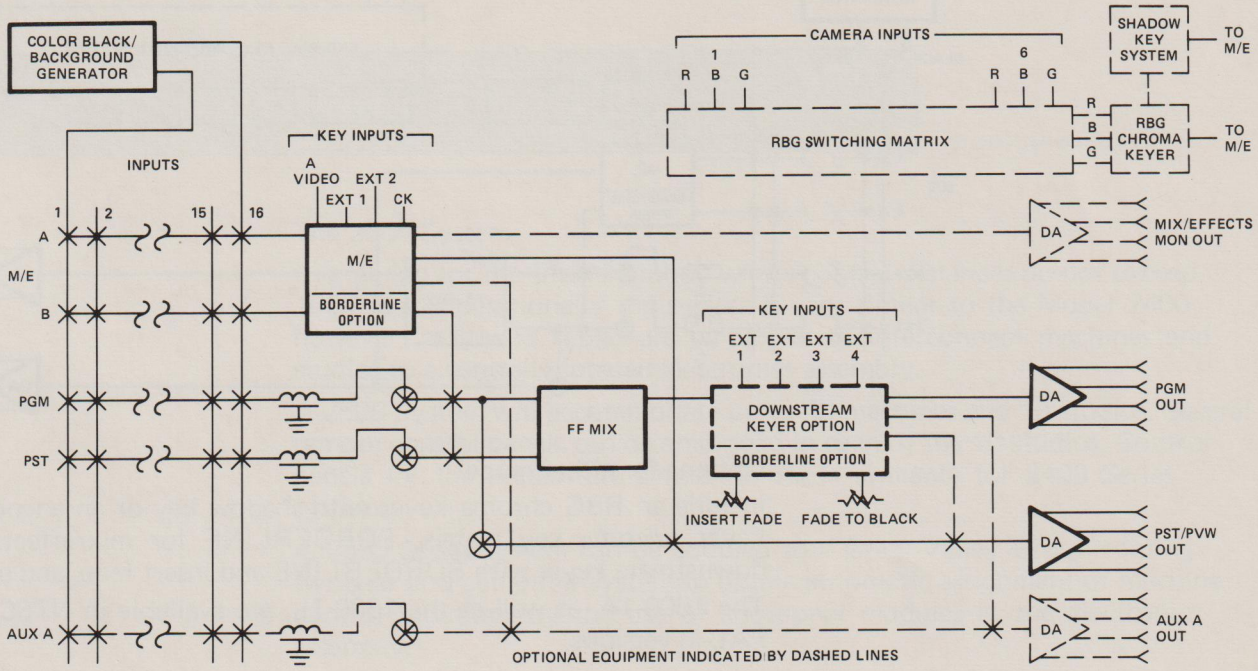
Model 1600-2V

is a general-purpose NTSC switching system intended for use in small studios, television remote units and post production suites. The 1600-2V provides rotary wipe transitions as well as conventional ones. It is supplied complete with module extenders, and two instruction manuals.

The switcher employs a 16x5 primary matrix, Buses 1 and 2 feed a mixing and special effects system, which is available as an input to buses 3 and 4 — PGM and PST; the fifth bus is an optional preview selector. Sources selected on the PST bus can be switched to the PGM bus by means of either the flip-flop mixer, or cut-bar switch.

Options for the 1600-2V include an RBG chroma keyer with shadow key or an encoded chroma keyer, chroma key matrix, BORDERLINE® generators, and a downstream keyer system with fade-to-black.

The system is also available in PAL (625/50) and PAL-M (525/60) versions.

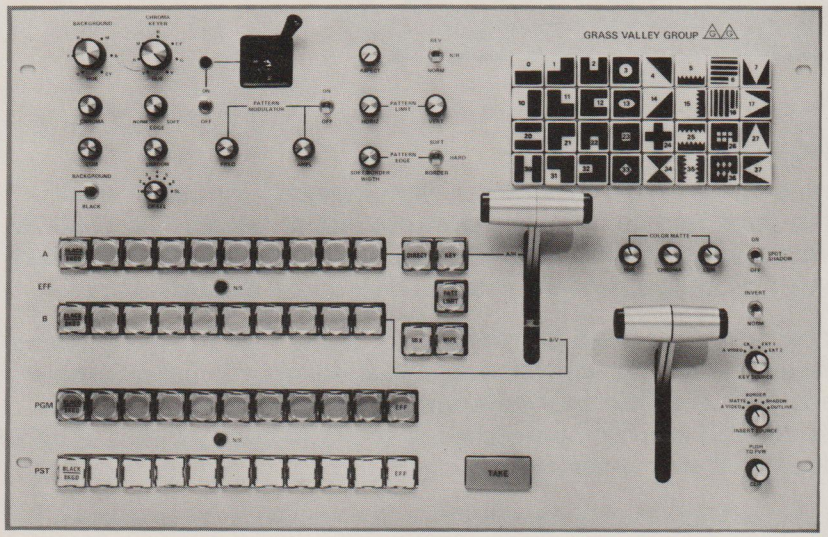


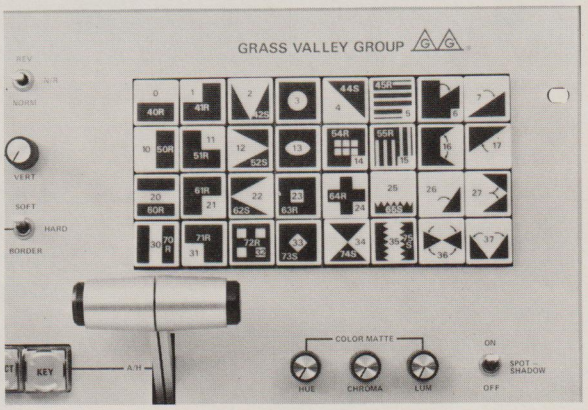
1600 SERIES SWITCHERS

Models 1600-1A and 1600-1L

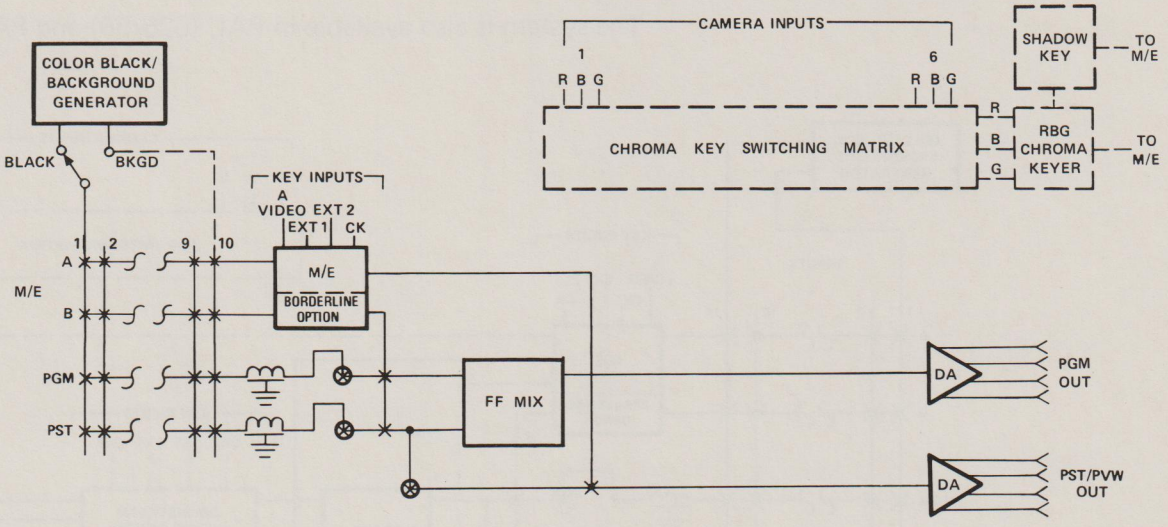
are general purpose switching systems intended for use in remote vans or small studios. The systems are identical in concept and format. The 1600-1L differs from the 1600-1A in that rotary wipe patterns are available in addition to conventional wipe patterns.

The switchers utilize a 10-input, 4-output primary matrix. Buses 1 and 2 feed the combined mixing and special effects system, which is available as a re-entry source to buses 3 and 4 - - program and preset. Sources selected on the preset bus can be switched to the program bus by means of a cut-bar switch. In addition, a video mixing amplifier allows dissolves to be made between the program and preset buses.





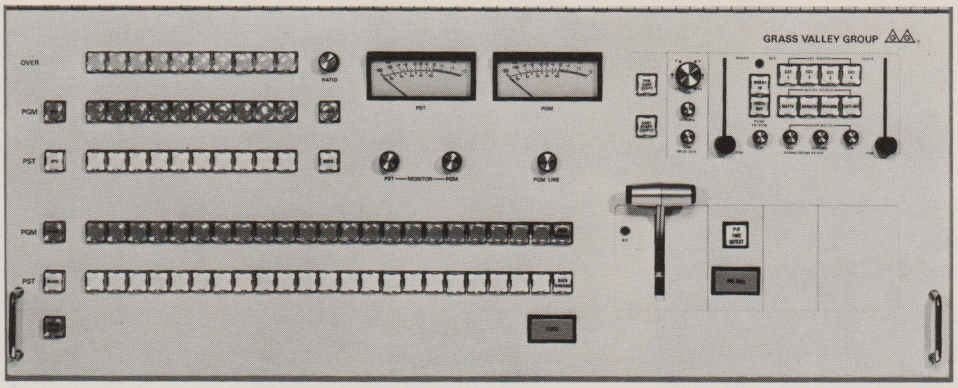
Model 1600-1A (left) and 1600-1L pattern selector (above).



Options for either model

include an RBG chroma keyer with shadow key or an encoded chroma keyer, chroma key matrix, BORDERLINE for mix/effects system, downstream keyer with BORDERLINE and insert fade, and an AFV system.

The 1600-1A, as well as the 1600-1L, are available in NTSC, PAL, and PAL-M versions.

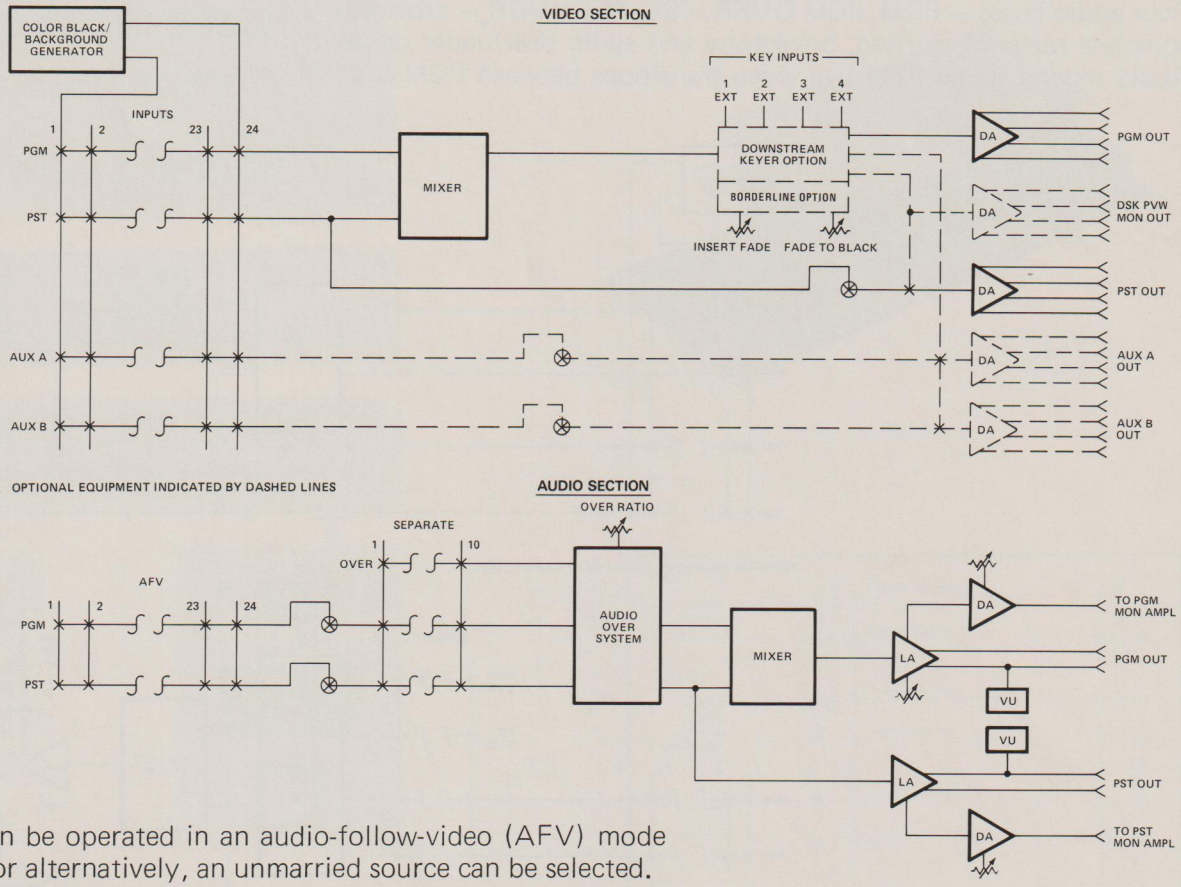


1600-4T

Model 1600-1T (16 input)
and Model 1600-4T (24 input)
Master Control Switchers

are general-purpose audio/video systems intended for master control room applications. The systems are supplied complete with module extenders, and two instruction manuals.

Two video buses are provided — PGM and PST. Sources selected on the PST bus can be switched to the PGM bus with a cut-bar switch. A video mixing amplifier also allows dissolves to be made between the PGM and PST buses.

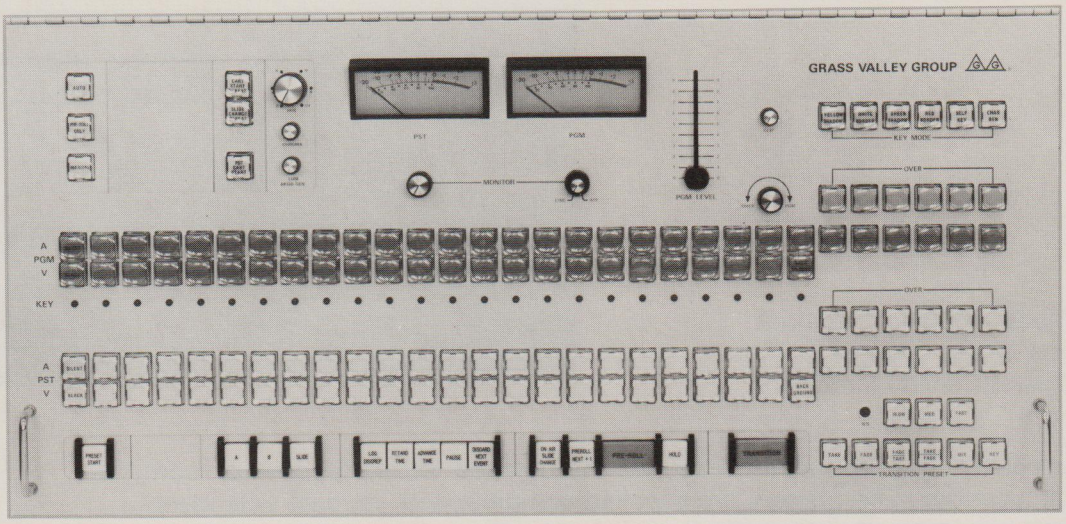


The audio section can be operated in an audio-follow-video (AFV) mode for married sources, or alternatively, an unmarried source can be selected. The latter can be placed over the program output when desired, VU meters are provided for both PGM or PST channels.

Optional equipment includes a downstream keyer system with BORDERLINE®, a preroll system for telecine and video tape sources, automatic start for audio cartridge machines, and a video preview selector with separate control panel.

The systems are also available in PAL (625/50) and PAL-M (525/60) versions.

1600 SERIES SWITCHERS

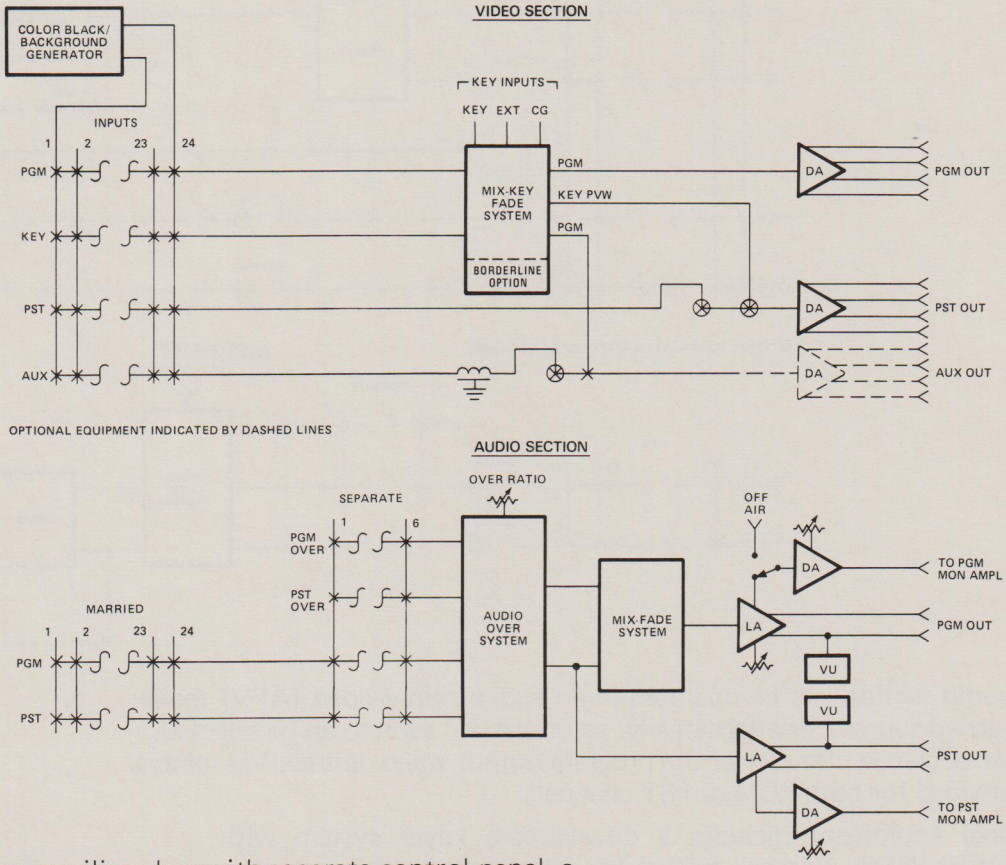


Model 1600-4S Audio-Video Master Control Switcher

is designed to optimize the efficiency of the master control operator whether used as a manual switcher or as part of the M200 automation system.

Three video buses are provided – PGM, PST and KEY. A sophisticated automatic transition system provides Take, Fade, Fade/Take, Take/Fade and Mix transitions between PGM and PST. The transition system also provides keys and programmed matte keys.

Four audio buses – PGM, PGM OVER, PST, PST OVER – provide a complete range of married, breakaway and audio over/under capability. Audio mixing follows the five video transitions between PGM and PST.



Optional equipment includes

A Borderline® generator, a video auxiliary bus with separate control panel, a preset start system for telecine and video tape sources, as well as the M200 modular automation system.

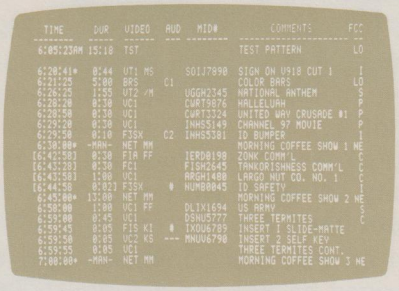
The 1600-4S is available in NTSC (525/60), PAL (625/50) and PAL-M (525/60) versions.

M200 modular automation

is a step-by-step approach to total automation of a broadcast station's on-air switching and machine control functions. The modular approach allows users to expand their systems as requirements change.

Expansion to higher levels is achieved by plug-in modules. Instead of employing a conventional mini-computer the M200 makes extensive use of the latest LSI technology, including microprocessors, random access memories and programmable read only memories.

M200 also employs unique built-in diagnostics wherein the system is continually being examined during operation. If a fault is detected the operator is alerted via the CRT display and diagnostic readouts, which indicate the nature and possible location of the fault and the steps required to best preserve system operation.


TIME DUR VIDEO AUD MID# COMMENTS FCC
6:05:23AM 15:18 TST TEST PATTERN LO
6:20:41+ 0:44 VT1 MS SQIJ7890 SIGN ON U918 CUT 1
6:21:25 5:00 BRS C1 COLOR BARS LO
6:26:25 1:55 VT2 /M UGGH2345 NATIONAL ANTHEM S
6:28:20 0:30 VC1 CWRT9876 HALLELUAH P
6:28:50 0:30 VC1 CWRT3324 UNITED WAY CRUSADE #1 P
6:29:20 0:30 VC1 INHS5149 CHANNEL 97 MOVIE P
6:29:50 0:10 F3SX C2. INHS5301 ID BUMPER I
6:30:00+ -MAN- NET MM MORNING COFFEE SHOW 1 ME
6:41:58 0:30 FTA FF JERD8190 ZONK COMM'L C
6:42:28 0:30 FC1 FISH2645 TANKORISHNESS COMM'L C
6:43:58 1:00 VC1 ARGH1480 LARGO NUT CO. NO. 1 C
6:44:58 0:02 F3SX 0 NUMB0845 ID SAFETY I
6:45:00+ 13:00 NET MM MORNING COFFEE SHOW 2 ME
6:58:00 1:00 VC1 FF DLIX1694 US ARMY S
6:59:00 0:45 VC1 DSNU5777 THREE TERMITES C
6:59:45 0:05 F1S K1 0 IXOU6789 INSERT 1 SLIDE-MATTE
6:59:50 0:05 VC1 K5 --- MNOU6798 INSERT 2 SELF KEY
6:59:55 0:05 VC1 THREE TERMITES CONT.
7:00:00+ -MAN- NET MM MORNING COFFEE SHOW 3 ME

M200 Levels

M201: 1600-4S switcher

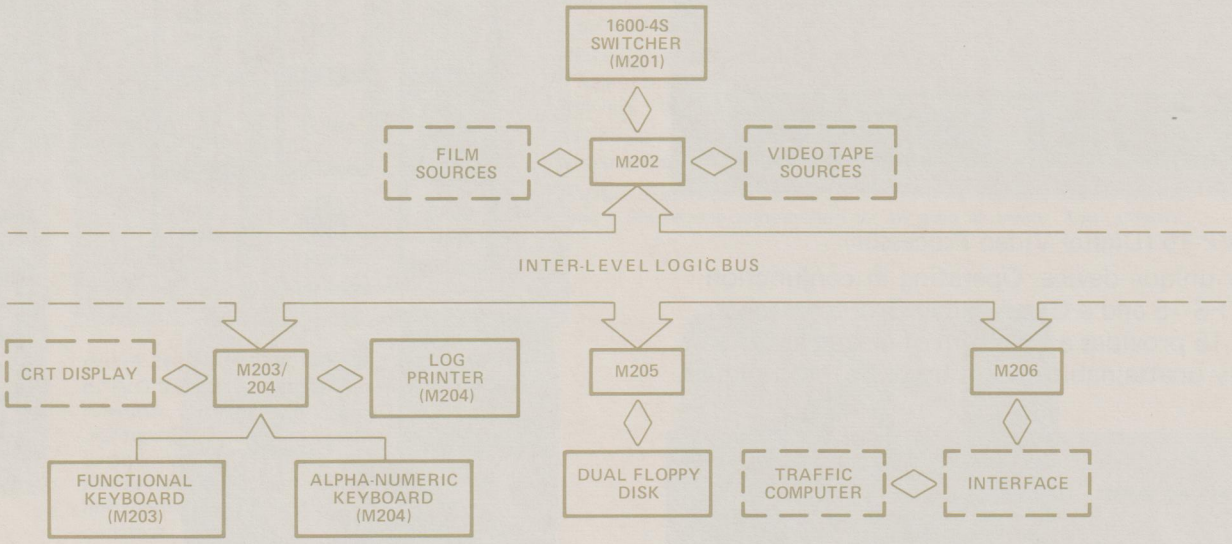
M202: One event intelligent preroll plus machine control interface for telecine projectors, video cassette or reel-to-reel recorders, and audio recorders, etc.

M203: 20 event storage, CRT display, and data entry via functional keyboard

M204: Up to 1,000 event storage, event duration or time of day control, event editing, alphanumeric keyboard, and log printing

M205: Bulk event storage with dual floppy disk system (future)

M206: Traffic computer interface (future)



At left and top right: M204 alphanumeric keyboard and CRT display.

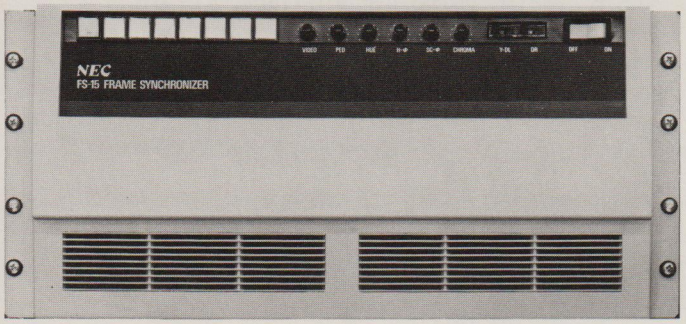
DIGITAL VIDEO EFFECTS

NEC Model FS-15 Frame Synchronizer

will automatically lock a nonsynchronous NTSC source to an external reference (such as local station sync and subcarrier) allowing the output to be treated as a local signal.

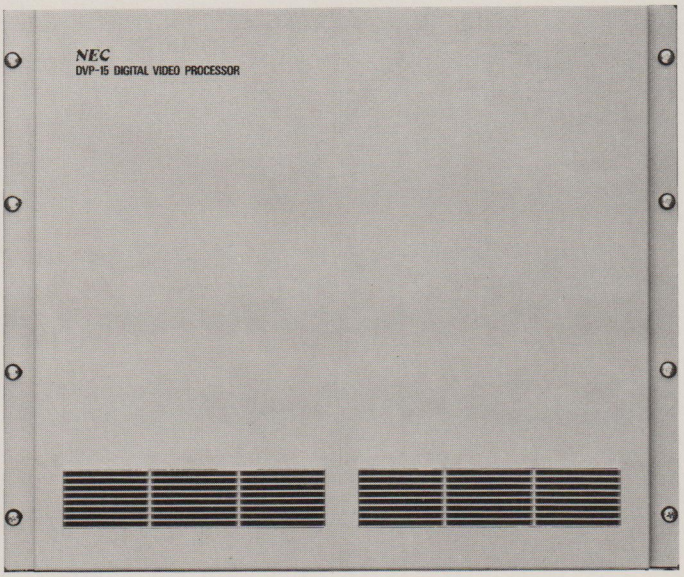
The FS-15 features compact size (8¾ inch high, rack mounting), low power consumption (250 VA), built-in memory analyzer, and latest semi-conductor technology, e.g., 16K ram memory elements. Optional features include a time base corrector, velocity corrector with drop-out compensation, and a freeze frame adapter.

When an FS-15 is combined with the DVP-15 (described below) and a Grass Valley Group 1600 Series switching system and interface, a wide range of video effects is possible. This building block approach allows users to expand from a frame synchronizer to a Digital Video Effects (DVE) system at any time. The effects system will operate from both synchronous and nonsynchronous NTSC sources, including helical scan tape recorders.



NEC DVP-15 (Digital Video Processor)

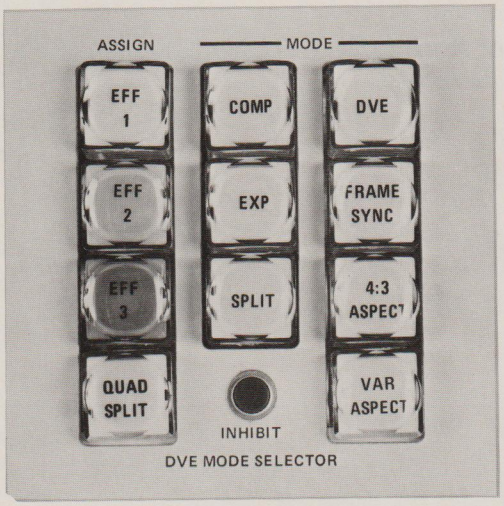
is a truly unique device. Operating in conjunction with the FS-15 and a Grass Valley Group switcher, the DVP-15 provides a spectrum of electronic effects previously unattainable except by optical techniques.

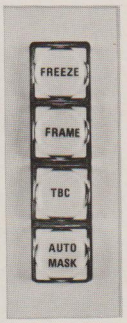


The DVE system provides continuous picture compression, picture expansion, and picture splitting effects. The system can be operated in a fixed 4:3 aspect ratio mode or, alternatively, H and V components can be independently controlled.

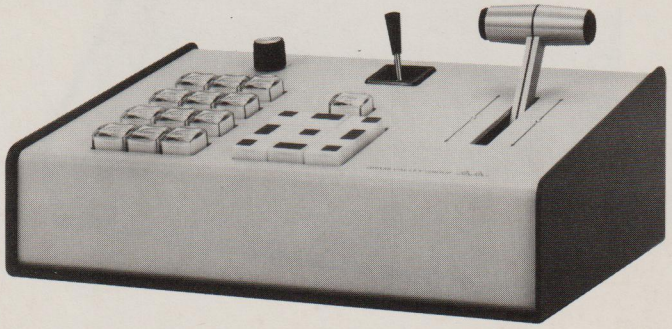
Picture size and position are determined by keying signals supplied from the video switcher. If the keying signal is obtained from the switcher's chroma key output, automatic 'tracking' of foreground and background scenes can be accomplished for the first time. An almost unlimited variety of effects is possible by re-entering the switcher output into the DVP-15.

The DVE system is completely integrated with the switcher. For example, switcher lever arms and positioners directly control picture size and position. When the DVE system is combined with the E-MEM switcher accessory, an extremely powerful production tool is created.

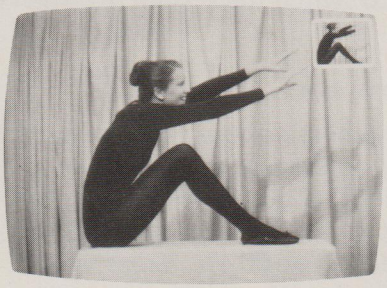




Upper left: NEC FS15 Frame Synchronizer. *Lower left:* NEC DVP15 Digital Video Processor. *Above & right:* switcher-mounted DVE controls. *Below:* the DVEC-1 control panel through which the DVE system can be used with nearly any production switcher.



A, B ▷



◁ C, D

◁ E

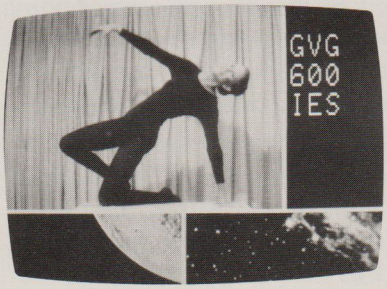
The DVE System provides automatic size and position tracking for chroma key inserts as illustrated in figures A and B. Note that shadows can also be included - - when desired.

Figures C and D illustrate how a box wipe pattern can be used to control picture size and position. The compressed scene can be inserted with hard, soft, or bordered edges.

If a compressed picture is re-entered into the system, the result is a "hall-of-mirrors" effect (figure E). The control signal is a box wipe pattern on the left. The size of the box determines the number of images.

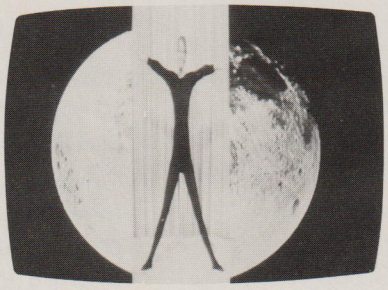
DVE will also track the quad split control signals of Grass Valley Group switchers (figures F and G). The compressed scene can be inserted in any quadrant.

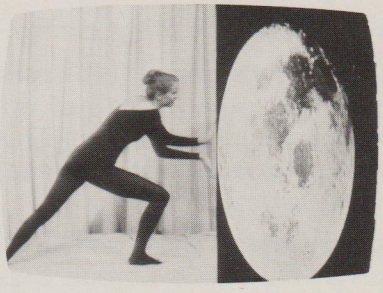
Picture compression can be applied to only one axis as illustrated in figures H and I. Single axis compression can be used to create "flip" effects.



◁ F, G

H, I ▷





400 SERIES SWITCHERS

The basic video switching matrix is arranged in a 32-input by 16-output format. A complete frame contains 21 printed circuit modules consisting of four input buffer amplifiers, sixteen crosspoint modules, and an interface module. Each buffer contains eight DC restorers together with other circuitry to drive eight 32 by 1 crosspoint modules. The latter also contain the line driving amplifiers. The interface module is used to "marry" the video matrix with other matrices, e.g., audio and tally.

The mounting frame employs exclusive Grass Valley Group zero insertion force connectors for mating the input buffer amplifiers to the crosspoint modules via the frame-mounted mother board. Modules are removed by a quarter turn screw on the front of each connector.

Since all video crosspoints for an output bus are contained on a single module, the system is thus destination oriented. A failure in a crosspoint module only affects one output bus; all other buses continue to operate normally. It is not necessary to switch the system off when removing modules.

The audio switching matrices

are similar to video switching matrices; consisting of input buffer modules, crosspoint modules, and a single interface module. The buffer modules utilize differential input circuitry to provide up to 80 dB of common mode rejection at 60 Hz. Grass Valley Group can supply systems with audio input and/or output transformers at extra cost — on special order.

It should be noted from the specifications that the audio system will operate at levels up to +24 dBm at 600 ohms or +30 dBm at 150 ohms — with full performance.

The flexible control concept

employed in the 400 Series allows systems to be addressed in two basic ways; (1) on an individual bus-by-bus basis, and (2) by means of a single X-Y panel for control of all buses.

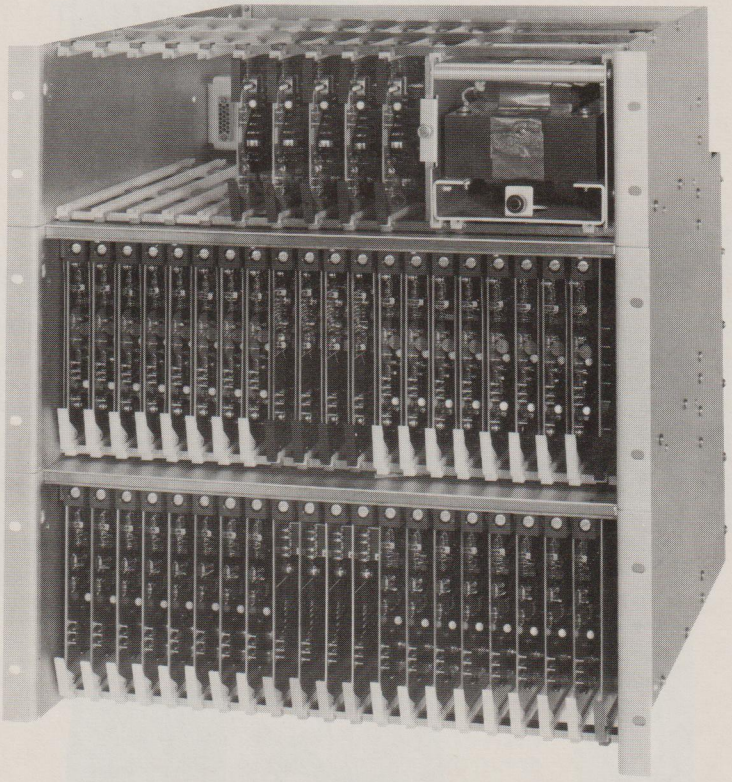
Several types of panels are offered for controlling individual output buses. These consist of panels with momentary illuminated pushbuttons corresponding to input sources, panels employing thumbwheel preset, LED status indicators and a take button, and 10-digit keyboards with LED status indication.

The X-Y control panel provides the means for both input selection and output assignment. This method of control operates via the input/output data port available on each matrix, as opposed to addressing the individual control bus connectors used with the panels described above. The data port also can be used for controlling systems via a computer.

A unique feature of the control system

allows several panels to be paralleled on a single output bus, even panels of different types, e.g., keyboard and pushbutton. The only limitation to paralleling panels is the current available for lighting lamps.

Special control panels can be provided on a custom-built basis. Consult Grass Valley Group with your requirements.



Output expansion of a basic 32 x 16 system

requires that input sources be distributed to each frame. We recommend that this fan-out be accomplished by distribution amplifiers; however, for less critical applications input signals can be looped through several frames.

A tally relay matrix

is available to provide contact closures corresponding to input sources. The system can be enabled on a bus by bus basis.

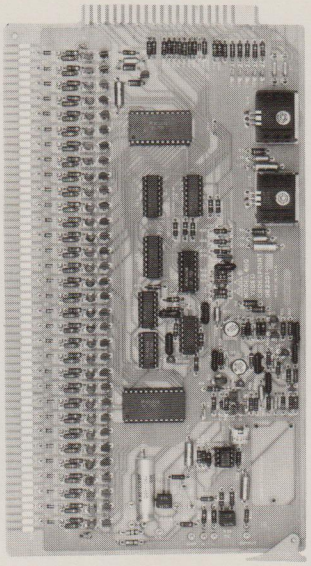
On special order, Grass Valley Group can provide matrices with relays corresponding to each crosspoint. The latter are particularly useful in distributing special control signals through a routing switcher.

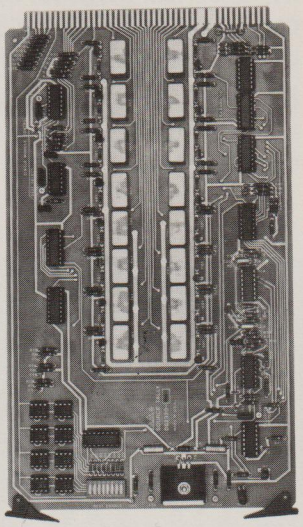
The power supply system

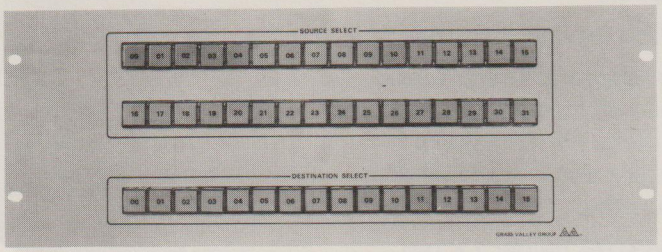
is unique. AC line current is first rectified to provide 48 volts direct current. This voltage is then converted to 15 volts DC by means of high efficiency DC to DC inverters for distribution to the matrices. The latter also provide regulation.

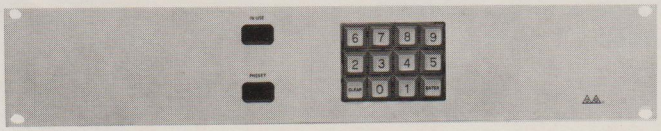
The 48 volt rectifiers, as well as the DC to DC inverters, are plug-in modules for ease of maintenance. Systems can be supplied with dual rectifiers fed from separate AC inputs for maximum system protection. A 400 Series routing switcher can also be fed directly from (nominal) 48 volt direct current sources.

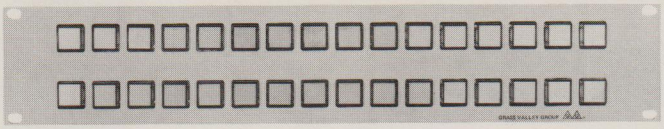
System crosspoint status can be maintained by an optional battery system. Short term protection (nominally 1 minute) is inherent in the standard system as a result of the CMOS memory elements employed.

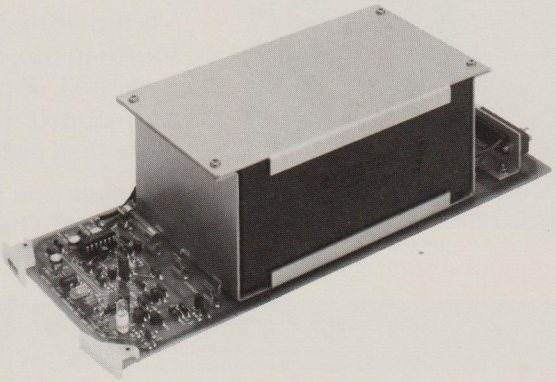


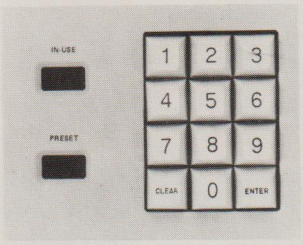


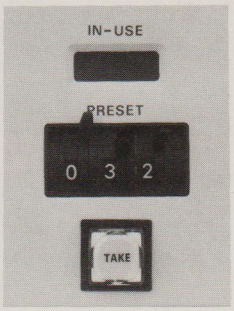






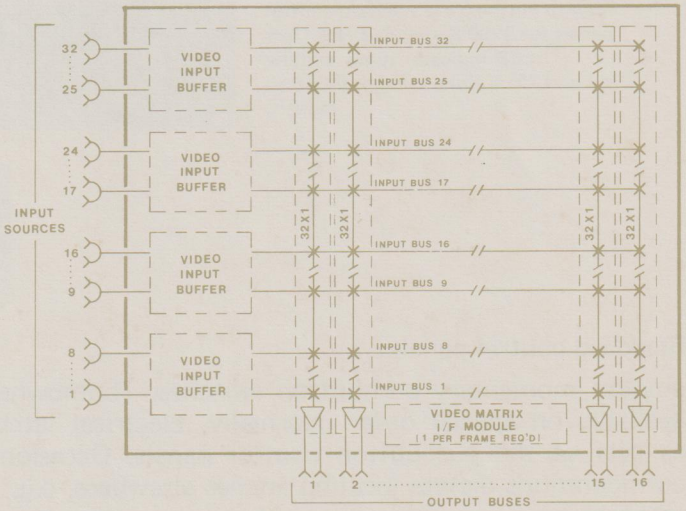






The control panels for the 400 Series are (*top to bottom, above*) rack mounted X-Y type, keypad and illuminated pushbutton, with compact keypad above left and thumbwheel type above right.

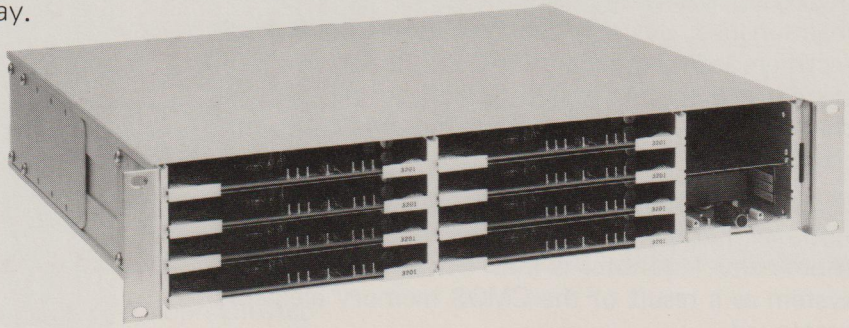
At upper right the three boards are video crosspoint (upper left), the source tally card (upper right) and battery backup board.

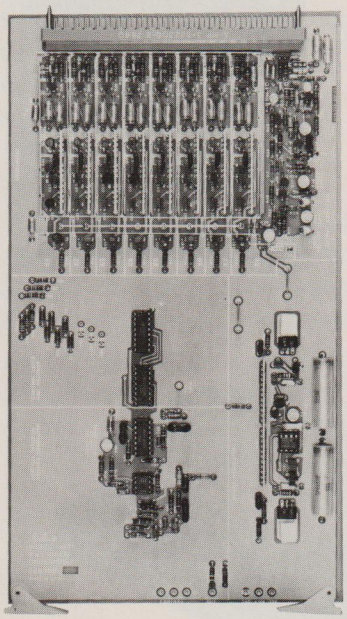


3200 Series equipment

is intended for general purpose, utility video switching applications. Symmetrical matrices up to 8 x 8 and assymmetrical matrices up to 29 x 2 can be assembled from 3200 Series components. The latter are particularly useful as auxiliary buses for production switchers.

Each mounting tray accommodates eight 8 x 1 modules and a power supply; thus, a complete 8 x 8, 29 x 2, or 15 x 4 matrix can be contained in a single 3½ inch high mounting tray.



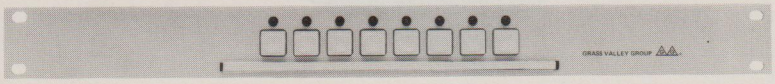


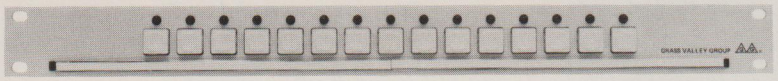
◁ Each 8 x 1 video crosspoint module

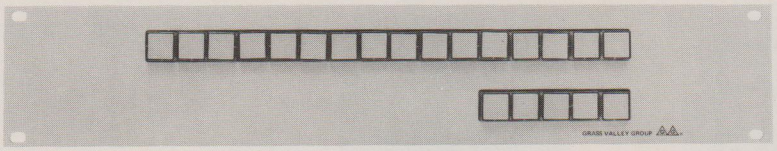
is complete with a 2-output, line driving amplifier.

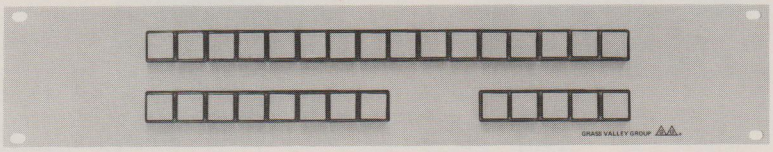
Vertical interval switching, referenced to the previous source-in-use, is employed. When clamped switching is desired, input fanout amplifiers (with clamps) are required. Fanout amplifiers are also needed when more than eight outputs are required.

Crosstalk and noise are at least 60 dB below 1V p-p to 5 MHz. The gain of each module is unity, although an adjustment of ±3 dB is provided.









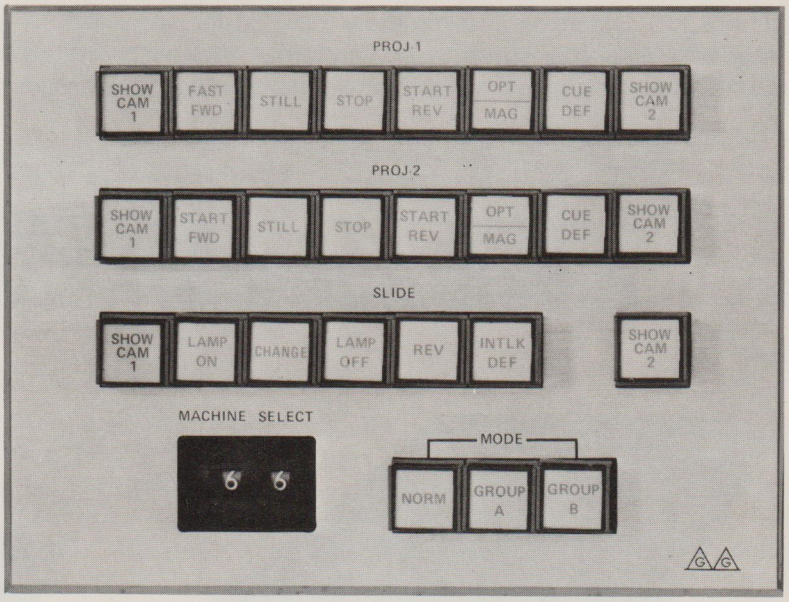
Top to bottom: the standard control panels for 3200 Series; 8x1 and 15x1 LED-indicator types, and the 21x1 and 29x1 illuminated pushbutton models.

Standard control panels

employ momentary pushbutton switches. Thumbwheel type panels are available on special order. Normally, electrical latches are included as part of the pushbutton control panels. Occasionally, mechanical considerations dictate locating latches elsewhere, e.g., near the switching matrices.

Control panels terminate at the rear of the video matrices for standard systems; special control configurations may require an interface frame.

2400/2500 MACHINE CONTROL SYSTEMS



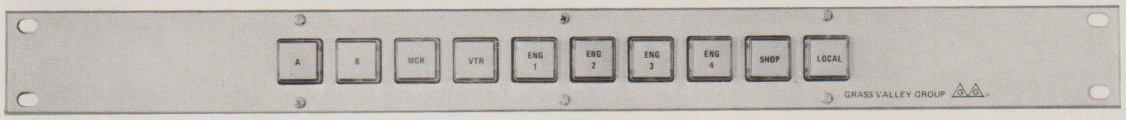
Typical studio remote control panel

The 2400 System

replaces multiwire cables and patching arrangements for remotely controlling telecine and VTR machines. The system utilizes a digital code for transmission of commands and tally information over conventional twisted pair cables up to a distance of 2000 feet/600 meters.

Machines are delegated to studios by means of small switching matrices. One bus is required for each studio. Up to 100 machines can be delegated to a single studio. Selection of a desired machine (once assigned) is obtained by selecting the machine's address on a thumbwheel switch in the studio (note illustration above). A time sharing technique allows commands to be transmitted from studio to machine and tally (status) information to be transmitted from machine to studio.

A 2400 Series system can be easily expanded: additional machines are accommodated by extending studio buses. If a studio is added, the system is expanded by providing an additional bus (twisted pair).



Studio delegate panel

The 2500 System

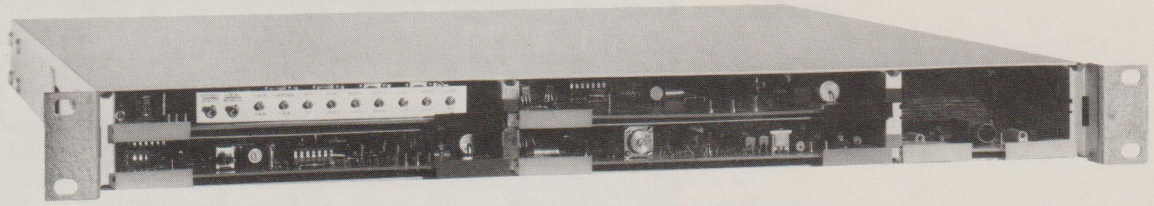
is intended for the smaller station where control distances do not exceed 1000 feet. Operationally the system is very similar to the Model 2400; however, multiwire cables are employed to interconnect machines and studios to a centrally located electronics assembly.

A 2500 System will accommodate up to 40 machines and 10 studios. Several remote control panels can be employed in each of the 10 studios. Control panels for the system are similar to those available for 2400 Series systems.

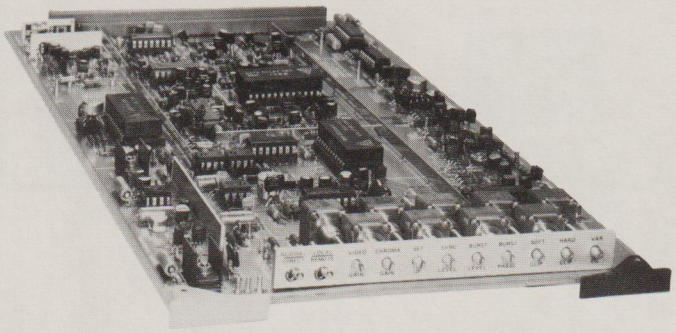
A 2500 Series system can be coupled to a Grass Valley Group routing switcher or a computer system to obtain automatic assignment of machine control functions by the use of additional modules in the electronics assembly.

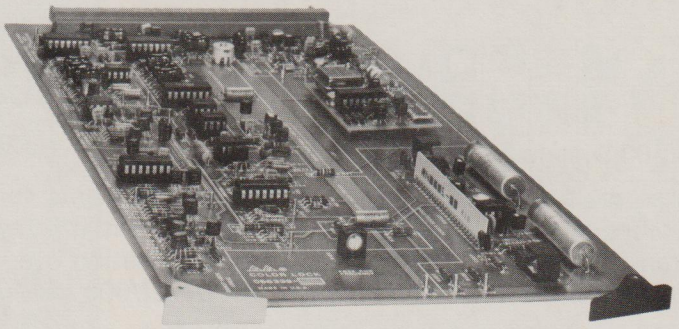
3240 VIDEO PROCESSING SYSTEM

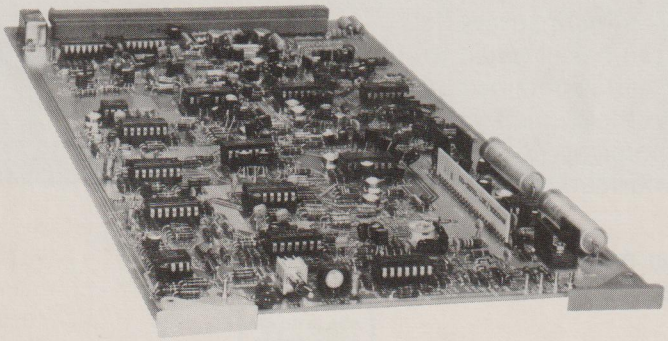
The 3240 system is a completely new design intended to satisfy the varied video processing requirements of a modern television station. The modular approach employed allows systems to be tailored for remote, studio, transmitter, and other specialized application within a broadcast facility.

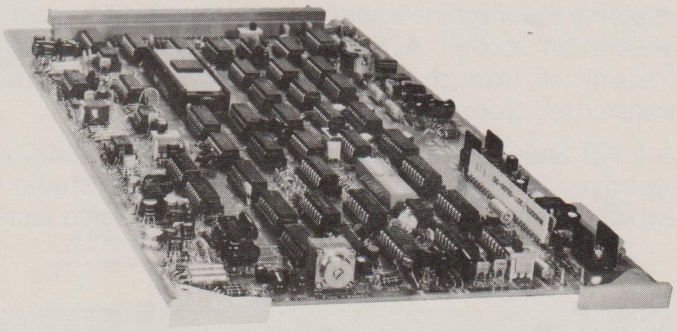


The basic 3240 processor in its one-rack unit frame. The modules are, clockwise from upper left; Input, Color Lock, Sync Generator and Output. 3200A Power Supply is at far right of frame.









Features of the basic system include

- Reduction of sync time base error when present on the input signal.
- Correction of burst axis offset errors.
- A high degree of hum rejection in both common and differential modes.
- Output transitions and pulse edges all have sine-squared shape and appropriate rise times.
- Maintenance and convergence of SCH phasing.
- Vertical interval lines can be selectively passed or blanked.
- Continuous output of color black if input is interrupted.
- Regeneration of sync and burst.
- Phase linear chroma and luminance separation.
- Complete remote control of all operating parameters.
- Six video outputs.

The basic system consists of the four circuit modules shown above plus a power supply module. The system is contained in a 1¾ inch high by 19-inch rack mounting frame. A 3½ inch high frame is used for applications requiring optional modules. The larger frame also provides space for a second, parallel connected power supply for added reliability.

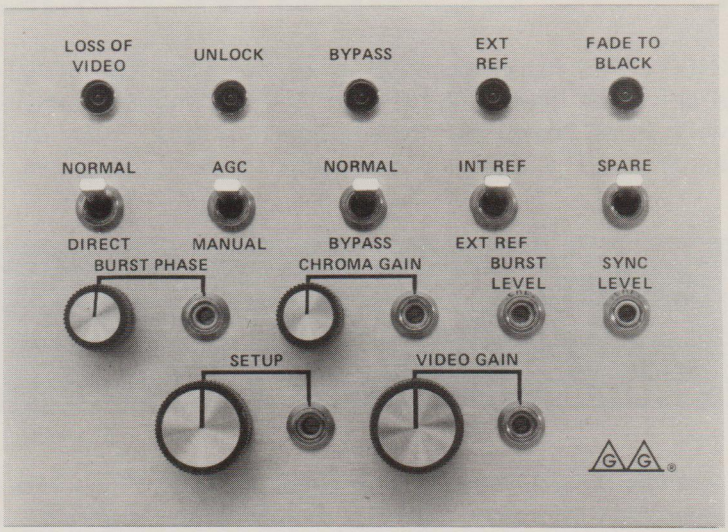
All operating adjustments can be remotely controlled. Normally, systems are controlled from a distant point; however, a 'master' remote control panel can be located adjacent to the electronics assembly. This panel, in turn, can be used to delegate any (or all) functions to a second control point.

3240 options include

- Automatic Gain Control
- Pulse DAs of two types
- Relay Bypass
- Fade-to-Black remote control
- Remote panels of three types
- Linearity corrector

The AGC module

reduces signal level fluctuations. If either peak white video or luminance levels, highest RGB levels, or peak sync level exceed preset limits, the video gain is automatically reduced. The reference levels for each type of sample are selectable. Gain fluctuations, possible when one field has a higher peak level than another, are prevented by a technique which samples



Top: console remote control panel. *Above:* rack-mount 'master' remote control panel. *Below:* 3220 Linearity Corrector.

an entire frame. The samplers may be gated on during either (A) pictures and vertical interval times, (B) picture only time, (C) on picture and vertical interval lines which are passed, or (D) only vertical lines which are passed. The AGC may be remoted.

The Pulse DA-1

provides two outputs for each pulse; burst flag, composite sync, composite blanking, H and V drives, and color frame. The DA-1 also provides a switch-selectable test signal output; black or white picture, dots, H or V lines, cross hatch, window or field square wave, or black phase reference. All pulses have $\sin^2$ rise times.

The Pulse DA-2

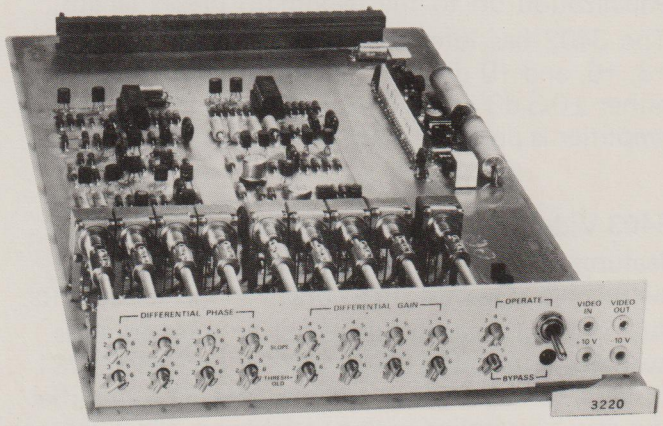
provides one output each of the pulses listed above. The DA-2 pulse edges are ramps as opposed to the $\sin^2$ shapes of the DA-1. Both DAs provide adjustment to 2- or 4-Volt pulses.

Relay Bypass

permits 'straight through' operation of a 3240 system in case of power failure by connecting the input to one output. Operation is either automatic or manual, with remote control. LEDs indicate the bypass status, either at the electronics frame or the remote panel.

The linearity corrector

option provides control of differential phase and gain parameters and is particularly useful in transmitter applications. The differential phase section contains four threshold controls. Independent adjustment (either plus or minus slope) is available within each range. The differential gain correction section also contains four threshold controls. Both positive and negative correction is available within each range. Interaction between the phase and gain sections is negligible. The 3220 linearity corrector module is also available as a stand-alone device.

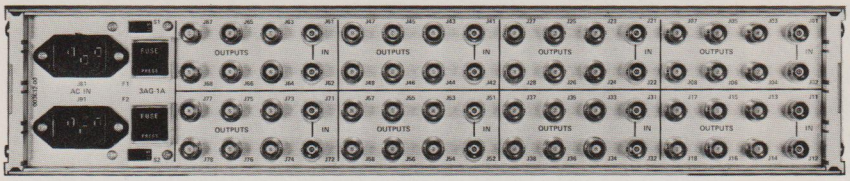


Future options include

- External sync reference module
- VIR AGC module

3400 SERIES MODULES

3400 Series mounting trays are of two sizes. The 3400T-1A tray has cell space for four modules and one power supply. The 3400T-2A has eight cells for modules, and two power supplies. Mounting trays are supplied complete with front covers and rear supporting rails. Trays may be removed without unbolting the rear rail support hardware. The 3200A power supply provides plus and minus filtered, unregulated, DC for 3400 Series modules.



Left: 3400T-2A, and *above* -1A rack mount trays. *Below, top to bottom:* 3200A power supply, 3401, 3402, 3403.

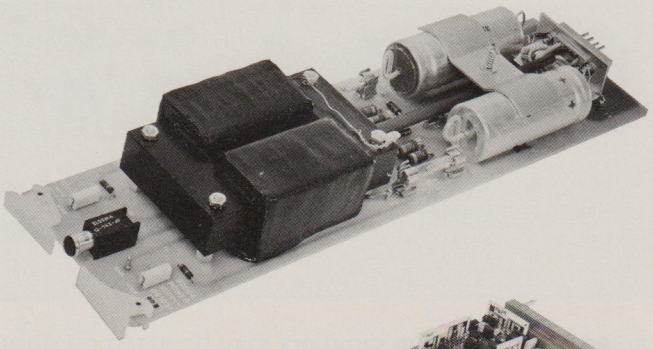
A single 3200A powers up to eight modules. When two are installed in a 3400T-2A tray, the second serves as an emergency source of power; it is automatically parallel connected to the first one. Split primary windings permit the supply to operate from 120V or 240V sources, 50/60Hz.

3401 Video Distribution Amplifier

is a general-purpose, 6 output video or subcarrier DA with switchable AC or DC coupling.

An optional fixed cable equalizer submodule is available to equalize up to 500 ft. of Belden 8281 (double shielded) cable or equivalent. The amplifier can also be supplied with a variable equalizer control (3401V) to provide continuous equalization up to the maximum length preset in the submodule.

The 3401 has a -2 dB to +3 dB gain range. The input circuit has a ±30V common mode range.

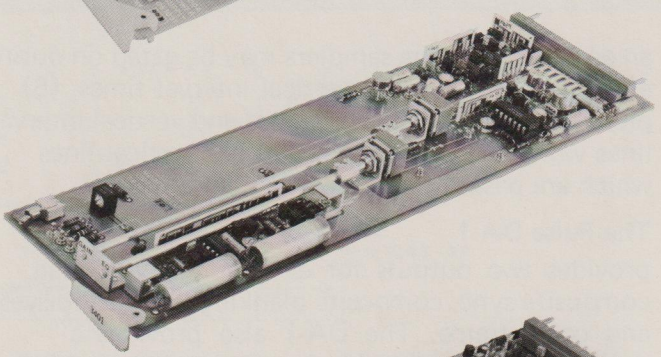


3402 Video Distribution Amplifier

is an extremely high performance video DA with switchable DC restoration and 6 outputs.

An optional fixed cable equalizer submodule is available to equalize up to 500 ft. of Belden 8281 (double shielded) cable or equivalent. The amplifier can also be supplied with a variable equalizer control (3402V) to provide continuous equalization up to the maximum preset length.

The 3402 has internal coarse adjustments of 0, +3, +6, and +9 dB gain; a vernier control provides either ±0.5 dB or ±2.0 dB gain range. Each amplifier is preset to 18.6 ns electrical length.

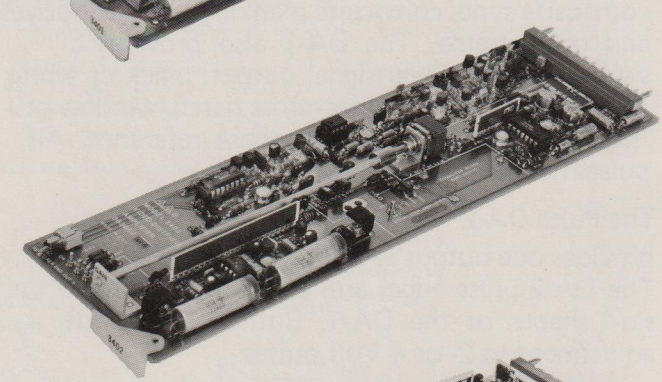


3403 Video Distribution Amplifier

features an effective sync tip clamp with switchable slow/fast time constant, and six outputs.

An optional fixed cable equalizer submodule is available to equalize up to 1000 ft. of Belden 8281 (double shielded) cable or equivalent. The amplifier can also be supplied with a variable equalizer control (3403V) to provide continuous equalization up to the maximum preset length.

The gain range of the 3403 is continuously adjustable from -3 dB to +3 dB. The clamp circuit can be switched off to provide AC coupled operation.

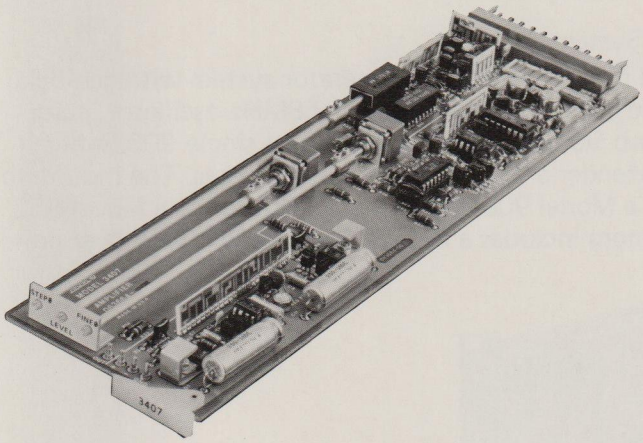


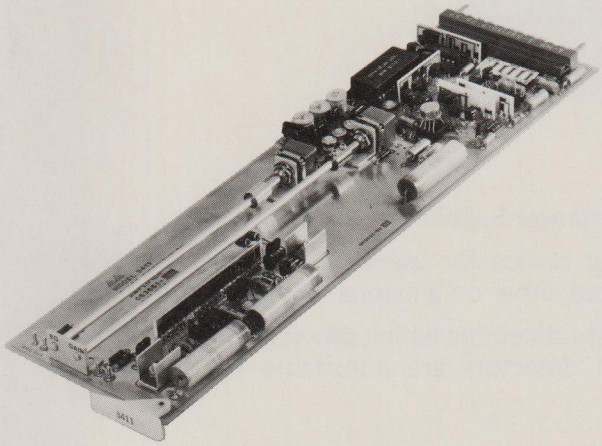
3407 Subcarrier Distribution Amplifier

is applicable to both NTSC (3.58 MHz) and PAL (4.43 MHz) systems.

The amplifier regenerates and filters the input signal to assure constant output amplitude. The output level can be adjusted for either 1 volt or 2 volt distribution systems. Both coarse and fine phase shift controls are provided so that a complete 360 degree adjustment range is available. Six source-terminated outputs are provided.

For linear subcarrier distribution see model 3401.





3411 Pulse Distribution Amplifier

is a linear, 6 output pulse DA featuring controlled rise time — 140 ns for NTSC systems or 250 ns for PAL systems.

The controlled rise time feature is achieved by means of a 7-pole Bessel filter. An optional cable equalizer submodule can compensate up to 500 ft. of Belden 8281 (double shielded) cable or equivalent. A variable equalizer control is standard.

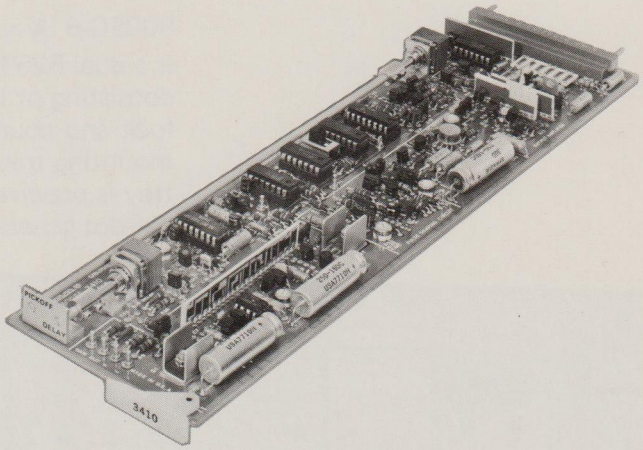
The gain range of the 3411 is continuously adjustable between -4 dB and +1 dB. Common mode range is ±30 volts.

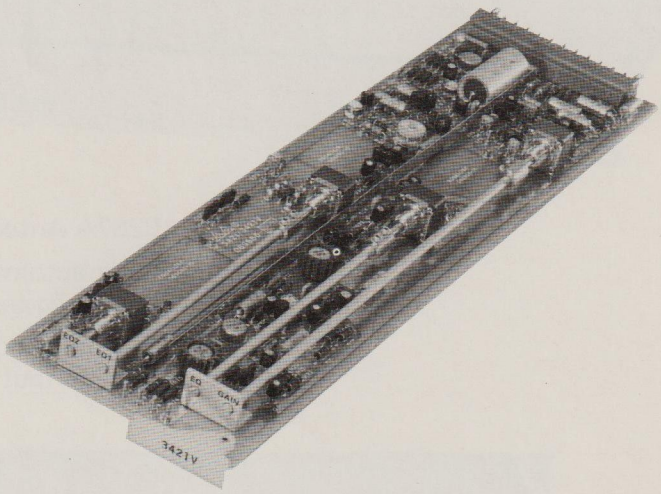
3410 Pulse Distribution Amplifier

is a regenerative type, 6 output pulse DA featuring adjustable rise time as well as adjustable time delay.

The rise and fall times of the output pulses can be set to any value between 140 ns and 300 ns, thus accommodating both NTSC and PAL requirements. The time delay circuitry has two modes of operation — fixed and variable. In the fixed delay mode, the overall delay is approximately 300 ns. In the variable delay mode, adjustment is provided between approximately 400 ns and 4 μs.

Output level is adjustable from -2 Volts to -4 Volts.





3421V

long cable equalizing video amplifier is a differential input 3-stage special purpose amplifier having a terminated input and only two outputs. The input has a nominal ±10V common mode range plus special circuit protection against voltage transients normally associated with very long cables. It always operates in AC coupled mode. Adjustable gain from +2dB to -3dB.

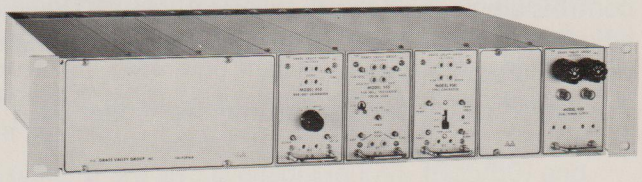
Depending upon the plug-in equalizer used the 3421V can equalize up to 2,100' of RG59B/U; 3,000' of Belden 8281; 3,900' of RG11/U or 11A/U; or 5,400' of Belden 8213 cable.

900 SERIES SYSTEMS

900SG-2 Sync Generator System

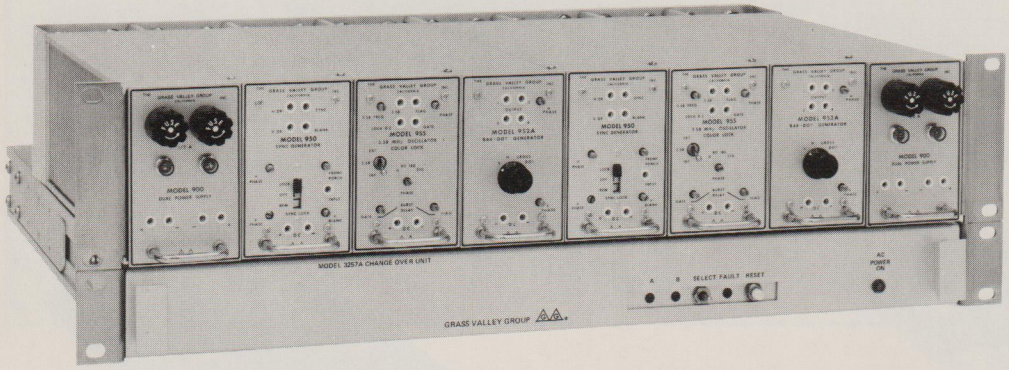
is a 525-line, 60-field NTSC color synchronizing generator system with genlock, consisting of a 950 sync generator, a 955 (3.58 MHz oscillator, color lock, and counter), a 900PS power supply, and a 900 Series mounting tray. The system is supplied complete with module extender and two instruction manuals. The mounting tray is prewired to accept a Model 908 color black generator or a Model 952 bar-dot generator.

The system is not available in a PAL or PAL-M version.



900SG-6 Sync Generator System

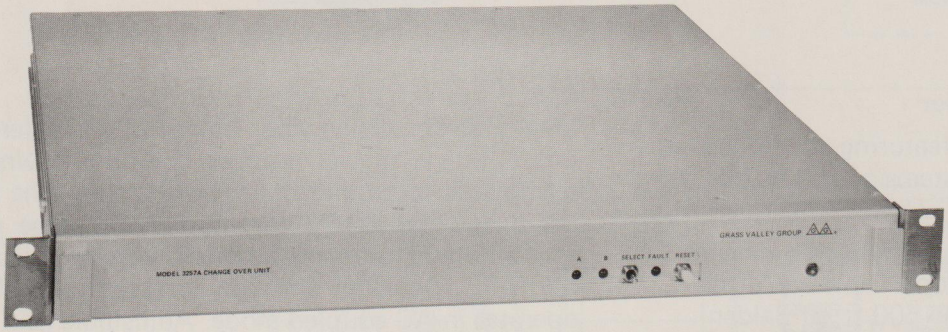
is a dual 525 line, 60 field NTSC color Sync Generator system with genlock, consisting of two 950 sync generators, two 955s (3.58MHz oscillator, color lock and counter), and two 900PS power supplies in a single 900 Series mounting tray, module extender and two instruction manuals. The mounting tray is prewired to accept a Model 908 color black generator or a Model 952 bar-dot generator. The system includes a 3257A Automatic Changeover unit.



3257A Automatic Changeover Switch

is an automatic transfer device for use with synchronizing generators. Switching can be initiated either on a manual or an automatic basis.

The 3257A contains eight detectors which provide sensing for eight of the nine output lines. All detectors are adjustable to operate with



either 2 volt or 4 volt pulses and 1 volt or 2 volt subcarrier signals. One detector has increased gain to permit sensing of a low-level, steady state signal such as color black or encoded pulse reference.

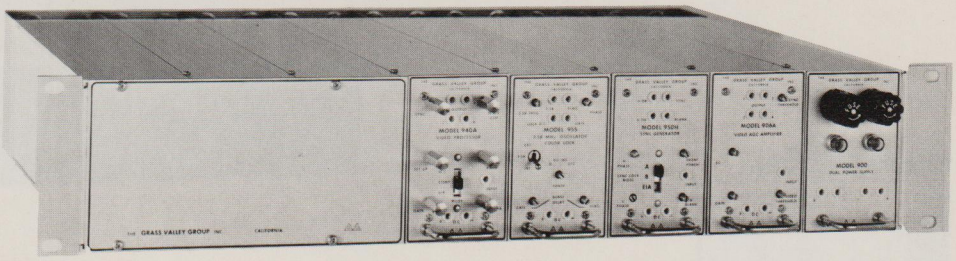
The switch is applicable to all types of synchronizing generators as well as all television standards — NTSC, PAL, PAL-M, and SECAM.

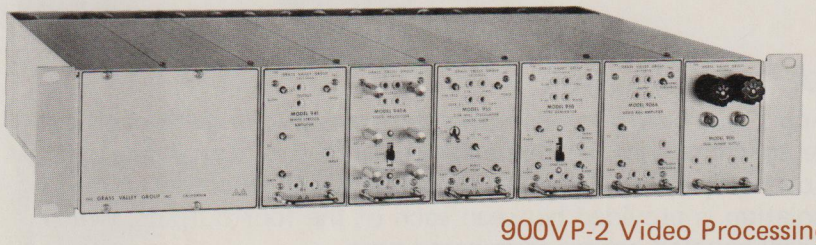
900 SERIES SYSTEMS

900 Series video processing systems are cost effective ones designed in several versions to accommodate the differing requirements of studios, transmitters, helical scan video tape recorders, etc.

All systems basically consist of a 940 module and a 950 sync generator with genlock. Instead of stretching and clipping sync, the systems employ a high speed switch which removes the entire blanking interval — sync, setup, and color burst — and reinserts a new blanking interval.

Processing systems for use with helical scan video tape recorders employ 950H Series sync generators which effectively ignore the information missing during the head dropout period. Although the systems are not time base correctors, they are frequently employed as an economical means of synchronizing cameras with a single tape machine; pulses taken from the sync generator are used to drive the cameras.





900VP-2 Video Processing System

is a 525-line, 60-field NTSC color processing system consisting of a 940B processing amplifier, a 950 sync generator, a 962 (3.58 MHz color lock), a 900PS power supply, and a 900 Series mounting tray. The system is supplied complete with module extender and two instruction manuals. The mounting tray is prewired to accept a Model 906A video AGC amplifier. The 900 VP-2 is intended for NTSC broadcast application.

900VP-3 Video Processing System

is a 525-line, 60-field NTSC color processing system consisting of a 940B processing amplifier, a 950 sync generator, a 955 (3.58 MHz oscillator, color lock, and counter), a 900PS power supply, and a 900 Series mounting tray. The system is supplied complete with module extender and two instruction manuals. Inclusion of the 955 allows the 900VP-3 also to be used as an NTSC sync generator system.

900HP-3 Video Processing System

is a 525-line, 60-field NTSC helical scan processing system consisting of a 940A processing amplifier, a 950H sync generator, a 962 (3.58 MHz color lock), a 900PS power supply, and a 900 Series mounting tray. The system is supplied complete with module extender and two instruction manuals. The mounting tray is prewired to accept a 906A video AGC module. The 900HP-3 can be used in both broadcast and nonbroadcast applications.

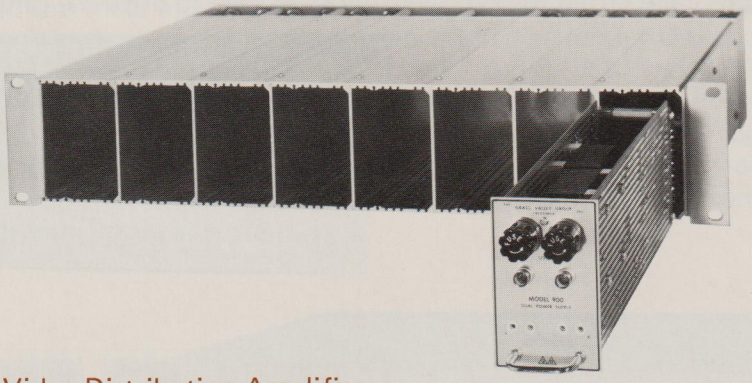
900HP-4 Video Processing System

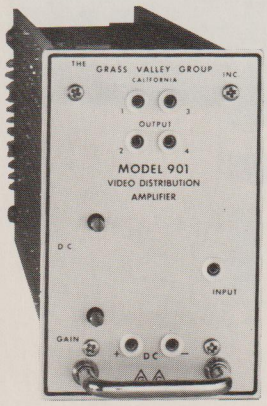
is a 525-line, 60-field NTSC helical scan processing system consisting of a 940A processing amplifier, a 950H sync generator, a 955 (3.58 MHz oscillator, color lock, and counter), a 900PS power supply, and a 900 Series mounting tray. The system is supplied complete with module extender and two instruction manuals. The mounting tray is prewired to accept a 906A module. Inclusion of the 955 allows the 900HP-4 also to be used as an NTSC sync generator system.

Systems on this page are not available in PAL or PAL-M versions.

900 SERIES SYSTEMS

900 Series modular mounting trays provide cells for eight plug-in modules, one or two (in some models) of which are always wired for 900PS power supplies. The rear plate of each tray contains BNC input and output connectors, remote control connections, and AC input receptacles. Several standard types for particular combinations of modules are available, or custom wiring may be requested. The 900PS power supplies provide unregulated positive and negative DC, and come in three types for differing power sources. The 900PS contains two rectifier/filter assemblies, with outputs paralleled through diodes so that each is a dual fail-safe unit. Each supply also contains two emitter followers which provide buffered sync and blanking pulses. Loop through input connectors are provided. The three types are the 900PS-1 (115V 60 Hz); 900PS-2 (100/115V 50/60Hz); 900PS-3 (200/220/240V 50Hz). Input power tolerance is ±10% in all cases.



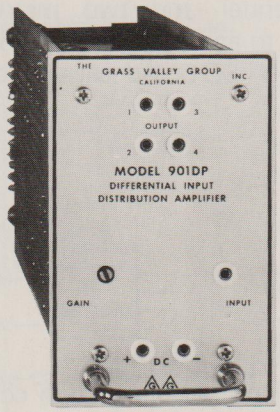


901 Video Distribution Amplifier

is a general-purpose, 4-output video distribution amplifier with excellent performance characteristics. High-impedance input circuitry allows several 901's to be connected in tandem with negligible signal distortion. A high degree of isolation is provided between each of the four outputs, which are of the direct-coupled, source-terminated type.

The amplifier has provision for adding synchronizing pulses to noncomposite input signals. The sync amplitude is adjustable over a wide range by means of an internal control.

Model 901 is designed for 1 V p-p signals, Up to 6 dB of gain is available to compensate for low-level inputs. Seven 901s can be installed in a tray.

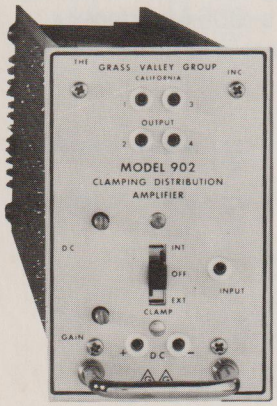


901DP Video Distribution Amplifier

is a 4-output video distribution amplifier featuring a differential input system, provision for cable equalization, and exceptionally high, carefully controlled performance characteristics.

The differential input circuit provides cancellation of hum and other in-phase interference components commonly encountered on long cable runs. The plug-in cable equalizer submodules can accommodate up to 1000 ft./300m of RG-11/U, Belden 8281, and similar type cables. The equalizer submodules can be supplied in increments of 50 ft./15m.

The 901DP is designed for use with 1V p-p signals. Up to 6 dB of gain is available to compensate for low-level inputs. The amplifier is commonly used as a cable-terminating and fanout device for studio switching systems.



902 Video Distribution Amplifier

is a general-purpose, 4-output video distribution amplifier featuring an extremely effective clamp. The clamp is of proven design and is highly tolerant of poor signals. In addition, the clamping circuitry is unaffected by burst or chrominance information and does not introduce the spurious signals often encountered in other clamping amplifiers. The clamp system can be either self-driven by a composite input signal or externally driven by synchronizing pulses for use with noncomposite inputs. A switch provides a choice of self-driven or external clamping, or clamp off.

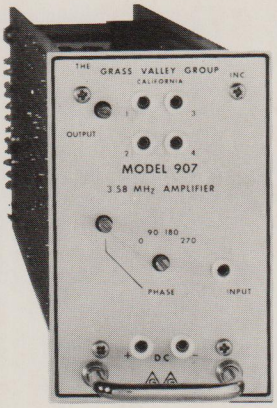
The other performance characteristics of the 902 are the same as Model 901.

903N Video Distribution Amplifier

is a 4-output video distribution amplifier featuring a differential input system, provision for cable equalization, and a control which allows boost or attenuation of signal components in the region of the color subcarrier.

The differential input circuit provides cancellation of hum and other interference components commonly encountered on long cable runs. The plug-in cable equalizer submodules can accommodate up to 1000 ft./300m of RG-11/U, Belden 8281, and similar type cables. The equalizer can be supplied factory-adjusted in increments of 50 ft./15m.

The 903N is often used in place of a video processing amplifier when regeneration of synchronizing pulses is not required. NTSC/PAL-M (3.58 MHz) and PAL (4.43 MHz) versions are available.



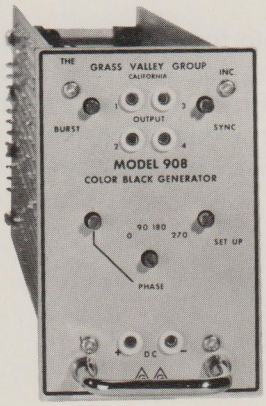
907 Subcarrier Distribution Amplifier

is a 4-output distribution amplifier for subcarrier signals and incorporates panel-mounted 360° phase shift controls.

The amplifier consists of a high-impedance input stage, a limiting amplifier and bandpass filter, the 360° phase shifter, and an output stage providing four highly-isolated, source-terminated signals.

The phase shift controls consist of a switch providing steps of 0°, 90°, 180°, and 270°, plus a 90° continuously variable control. The amplifier possesses excellent stability and can be easily reset.

The 907 is available in two versions: one for NTSC and PAL-M systems (3.58 MHz) and one for PAL systems (4.43 MHz).

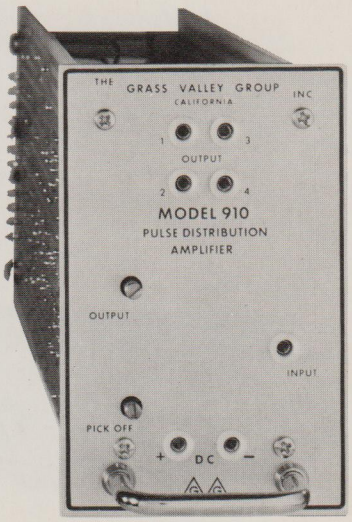


908 Color Black Generator

generates an NTSC color black reference signal consisting of sync, set-up, and color burst.

Panel mounted controls provide adjustment for sync amplitude, set-up amplitude, and burst amplitude. The burst phase is adjustable over a 360 degree range. The latter is achieved by means of a course control providing steps of 0, 90, 180, and 270 degrees. A vernier control provides continuous adjustment over a 90 degree range.

The 908 requires sync blanking and subcarrier inputs. Four 75 ohm, source terminated outputs are provided. The 908 can be used as a stand-alone device or, alternatively, installed in a prewired cell of a 900 series sync generator system.



910 Pulse Distribution Amplifier

is a regenerative type, four output DA for television pulses.

The amplifier consists of a high impedance input stage, reshaper, and four constant impedance output stages. Pulse regeneration is accomplished by selecting leading and trailing edges of the input pulses to trigger a set-reset flip flop, minimizing low frequency disturbances.

Front panel controls include PICK OFF for input selection and OUTPUT gain adjustment.

The 910 Pulse DA is cell interchangeable with any GVG 900 Series DA without tray wiring changes.

3274 BORDERLINE GENERATOR

BORDERLINE®

Top to bottom: Shadow, normal, bordered and outline BORDERLINE inserts.

BORDERLINE

BORDERLINE

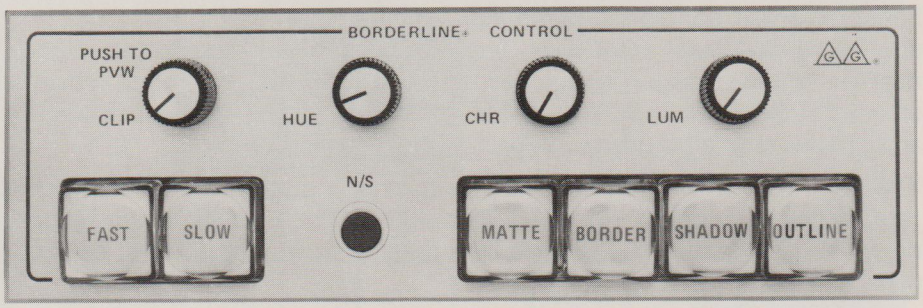
BORDERLINE

The 3274 Borderline Generator

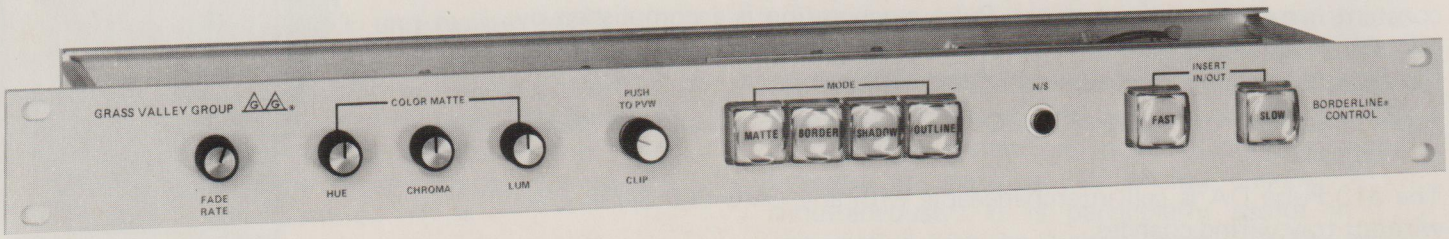
is a caption inserting device normally installed at the output of studio switching systems. Four modes of operation are provided; matte, border, shadow and outline. In addition, captions can be faded in or out with pushbuttons. The system is available in NTSC, PAL and PAL-M versions.

If the 'fast' fade button is depressed the insert will fade in or out rapidly, and if 'slow' is pushed the fade will be approximately ten times longer. In/out rates can also be mixed; rapid fade in followed by slow fade out, or vice versa. The transition rate is internally adjustable over a wide range.

Options available for the Borderline generator include a colorizer with complete remote control of hue, chrominance and luminance parameters, and a nonsynchronous detector submodule. The latter automatically inhibits an insert when a nonsync condition between the background source and the key source occurs.



Two types of remote control panels are available; a 19" rack mounting version for use with 1600-1A and -1L switching systems (below), and the console mounting version (above) which measures 2.25 x 7".



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For information in areas not listed above please contact the main offices of GVG:

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Bitney Springs Road
P. O. Box 1114
Grass Valley, California 95945 USA

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ATTN: Sales Office (or)
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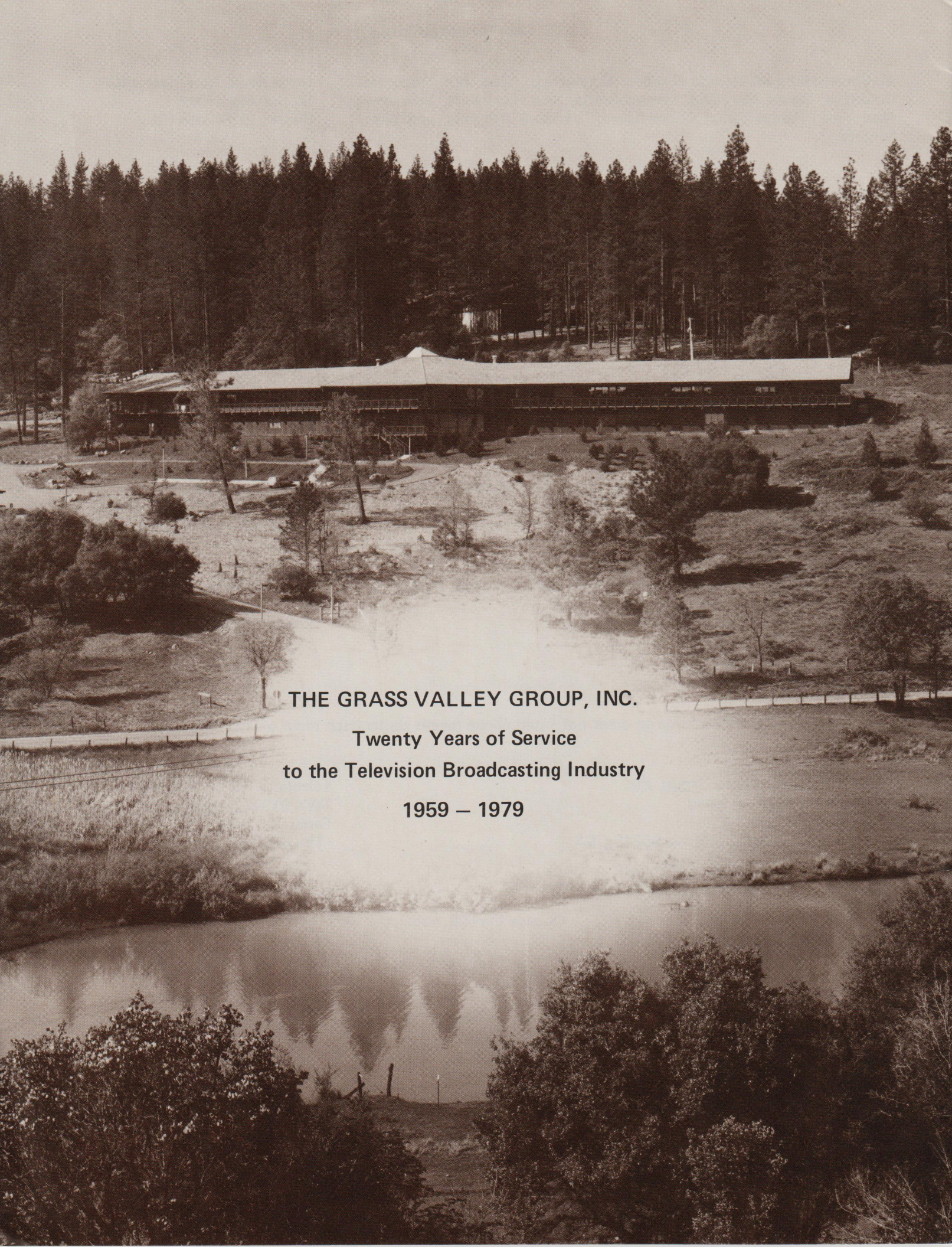

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Application: ☐ TV Broadcasting ☐ Post Production ☐ Industrial

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TV Standard: ☐ NTSC ☐ PAL ☐ PAL-M ☐ SECAM

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